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ABSTRACT

Seventeen intermediate level classes for the educable mentally retarded were involved in an investigation of the factor structure of the Social Learning Environment Rating Scale (SLERS), an instrument designed to quantify teacher-student behavior based on the Social Learning Curriculum (SLC). The 17 classes were observed implementing six experiences (lessons) from Function VII (Emotional Security) of the SLC. Analyses was based on the following five factors: problem emergence, problem clarification, problem resolution, application of learning, and the social learning environment. A major finding was that the factor structure underlying the SLERS generally validated the theoretical foundation of the SLC from which it was developed. (LS)

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The Factor Structure and Sources of Variation Underlying The Social Learning Environment Rating Scale

Monograph I

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Social Learning Curriculum

Curriculum Research and Development Center in Mental Retardation
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October 1975

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THE FACTOR STRUCTURE AND SOURCES OF VARIATION UNDERLYING
THE SOCIAL LEARNING ENVIRONMENT RATING SCALE
MONOGRAPH I

I. Leon Smith, Editor

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PREFACE

This monograph investigated the factor structure of the Social Learning Environment Rating Scale (SLERS), an instrument designed to quantify teacher-student behavior based on the Social Learning Curriculum (SLC). It is the first of an empirical trilogy dealing with the examination of a classroom observational system developed within the framework of the SLC. The second monograph is concerned with the relationship between the factor structure underlying the SLERS and specific student outcome measures. The third monograph examines types of verbal interaction occurring in SLC classrooms based on an instrument called the Social Learning Interaction System (SLIS) and their relationship to the SLERS factor structure and the student outcome measures.

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Raymond A. Bepko

SECTION I: INTRODUCTION TO THE SOCIAL LEARNING ENVIRONMENT RATING SCALE

Joyce P. Warshow and Raymond A. Bepko

PURPOSE

This monograph presents the theoretical rationale for and the development of the Social Learning Environment Rating Scale (Warshow & Bepko, 1974). The Social Learning Environment Rating Scale (SLERS) is a classroom observation instrument designed to examine teacher-student behavior within the framework of a large-scale curriculum for educable mentally handicapped (EMH) children, namely, the Social Learning Curriculum (Goldstein, 1974a). Most important, the paper examines the empirical quality of the SLERS with respect to its factor structure and ability to detect specific sources of variation - all of which have direct implications for the continued development and implementation of the Social Learning Curriculum (SLC).

THEORETICAL RATIONALE FOR THE SLERS

General

An observational approach to the examination of the SLC appeared warranted because comparative data on student outcomes would be meaningless without information on how, and under what circumstances, the SLC was implemented. Variation in the implementation of the SLC would certainly influence the results the program produces. Therefore, data regarding a program can be interpreted only within the context of information about differences in implementation. Simply stated, the process of implementation will effect the results of a curriculum. Information regarding that process must be considered in an examination of those results (Rosenshine, 1970; Rosenshine and Furst, 1973; Glennon, 1973).

The Social Learning Curriculum is unique in the sense that it specifies a structure and teaching strategy by which the curriculum is to be implemented. The SLERS was developed to monitor this way of implementating the curriculum. The analysis of this information is intended to provide a context for interpretation of measures which examine the effect of the SLC on the performance of EMH students. Additionally, it was felt that classroom observation information would be useful to curriculum developers for revision purposes and would provide a framework for teacher-supervisor interaction to optimize the use of the SLC.

Specific

The Social Learning Curriculum is designed to provide a comprehensive and systematic framework in which the child learns to take responsibility for his actions through the development of "life skills" necessary to think critically and act independently in his home, family, neighborhood and community (Heiss and Mischio, 1972). Critical thinking (CT) is the ability to process information within the framework of a problem-solving strategy in a consistent, appropriate, effective and efficient manner. Independent Action (IA) is the application of that strategy without undue reliance on other persons. These are the major objectives of the SLC since both are viewed as necessary for the social adjustment and adaptation of the individual.

Implementation of the SLC is based upon a Gestalt theory of learning applied to problem solving within the curriculum. It consists of three components: Mass, Differentiation, and Integration. The Mass is the emergence of a problem situation whose solution requires students to think critically. Differentiation is the separation and analysis of the elements of the problem. During the course of this analysis the student makes judgments about the antecedents and consequences of the problem, formulates possible solutions, assesses the likelihood of their success, and tests the alternative solutions. Integration is the

reorganization of the elements of the problem situation and the incorporation of the knowledge gained during their analysis to abstract a rule or concept which may then be applied, independently of the teacher, in similar future situations. Through this process of implementation, student attainment of critical thinking and independent action is facilitated. It should be emphasized that Mass, Differentiation, and Integration, like critical thinking and independent action, are not completely separate and distinct. It is a dynamic rather than static process, with an inherent overlap between stages.

Consistent with the overall M-D-I structure, the SLC prescribes the inductive strategy (Goldstein, 1974b). This method consists of the use of five-step hierarchical sequence of questions constituting the inductive teaching strategy (Greenberg and Smith, 1973). The stages in this hierarchy as well as the teacher and pupil behaviors descriptive of the sequence are as follows:

Labeling	(Has)[1]	pupils name objects or elements of the problem.
Detailing	(Has)	pupils describe elements in the problem situation
Inferring	(Has)	pupils make associations between ideas and events relevant to the problem and state possible solution.
Predicting	(Has)	pupils articulate probable solutions to a problem, predict the consequences of each solution, and try out the accepted solution.
Generalizing	(Has)	pupils apply concepts and skills learned in one problem-solving situation to a new but similar problem situation.

The relationship between the M-D-I structure and an inductive teaching strategy is apparent in the above definition of induction and in the earlier

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[1] "Has" refers to teacher behavior. Without the word "Has," the description refers to pupil behavior.

description of Mass, Differentiation, and Integration. The inductive teaching strategy was chosen since the primary target population of the SLC, EMH students, do not often possess the rules to guide their social behavior. Inductive problem solving allows them to formulate rules within the classroom environment and provides them with a strategy for dealing with problem situations outside the classroom.

Figure 1 is a schematic representation of the SLC teaching process. It visually demonstrates the theoretical relationship between Mass, Differentiation, Integration, critical thinking, independent action, and inductive teaching strategy.

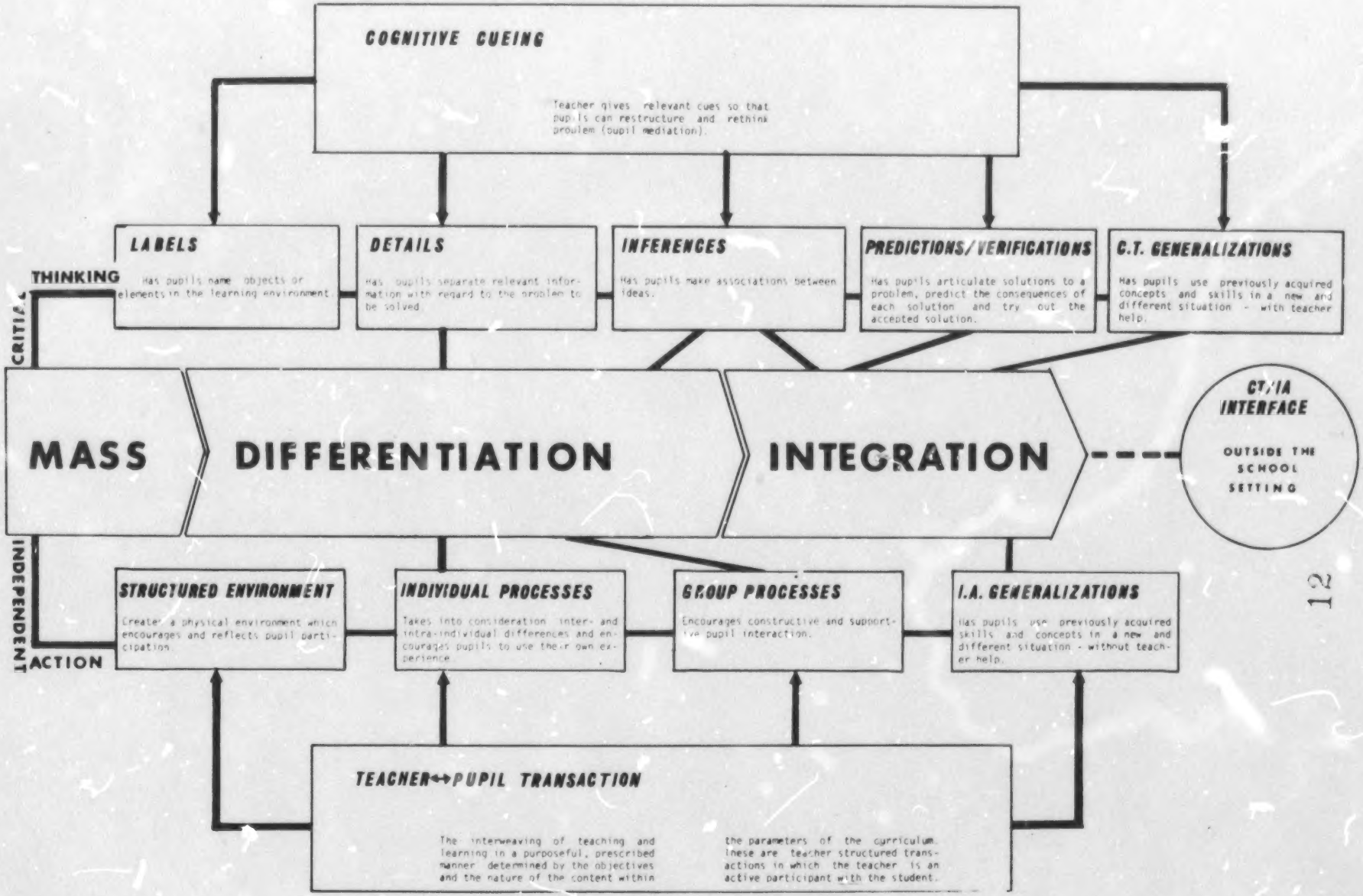
Independent action refers to those theoretical aspects of the learning environment which facilitate the teacher's use of the curriculum and the student's ability to think critically and act independently. Both the implementation structure and the attainment of critical thinking and independent action objectives initially occur within the environment of the classroom. That environment is actually a confluence of physical, social, and psychological elements.

The aspect related to the Mass stage in Figure 1 refers to the structuring of the physical environment to reflect pupil participation. Pupils are encouraged to move around the room to obtain needed materials which should be easily accessible.

There are two aspects related to the Differentiation stage. These are individual processes and group processes. In the first, the teacher is aware of and accepts differences in pupils. She structures learning experiences to meet individual needs. Pupils are encouraged to share their own backgrounds and experiences. They are also encouraged to express feelings, explore spontaneous interests and make their own decisions wherever possible. The ultimate goal is that pupils experience competence and "self-worth."

Figure 1

S.L.C. TEACHING PROCESS FLOW


COGNITIVE CUEING
Teacher gives relevant cues so that pupils can restructure and rethink problem (pupil mediation).
LABELS
Has pupils name objects or elements in the learning environment.
DETAILS
Has pupils separate relevant information with regard to the problem to be solved.
INFERENCES
Has pupils make associations between ideas.
PREDICTIONS/VERIFICATIONS
Has pupils articulate solutions to a problem, predict the consequences of each solution and try out the accepted solution.
C.T. GENERALIZATIONS
Has pupils use previously acquired concepts and skills in a new and different situation - with teacher help.
CRITICAL THINKING
MASS
DIFFERENTIATION
INTEGRATION
CT/IA INTERFACE
OUTSIDE THE SCHOOL SETTING
INDEPENDENT ACTION
STRUCTURED ENVIRONMENT
Creates a physical environment which encourages and reflects pupil participation.
INDIVIDUAL PROCESSES
Takes into consideration inter- and intra-individual differences and encourages pupils to use their own experience.
GROUP PROCESSES
Encourages constructive and supportive pupil interaction.
I.A. GENERALIZATIONS
Has pupils use previously acquired skills and concepts in a new and different situation - without teacher help.
TEACHER↔PUPIL TRANSACTION
The interweaving of teaching and learning in a purposeful, prescribed manner determined by the objectives and the nature of the content within the parameters of the curriculum. These are teacher structured transactions in which the teacher is an active participant with the student.

Group processes refer to pupils working together to solve problems with the teacher serving first as an initiator of learning and then as a resource. The focus in this environmental element is on pupil interaction as a contributor to the group problem-solving process. Here the actual solution to the problem is less important than the process. In addition, the teacher takes into consideration individual differences as they relate to constructive and supportive pupil interaction.

The aspect related to the Integration stage has to do with structuring the environment to facilitate the application of a generalization or concept learned to a new situation with a minimum of assistance. The ultimate test of whether pupils can think critically and act independently is if generalizations learned in the classroom are transferred outside of the classroom and are maintained through adulthood. The likelihood of this occurring seems to be increased if it can be observed that the pupil behaviors associated with these constructs can be seen operating in the classroom.

DEVELOPMENT OF THE SLERS

Given these theoretical issues, it became apparent that an instrument designed for observing the SLC in action should encompass three related dimensions: a) the major objectives of critical thinking and independent action, b) the Mass - Differentiation - Integration structure of the SLC and the related inductive teaching methodology, and c) the classroom environment in which the curriculum would be used. Additionally, the individual teachers' management and understanding of the curriculum had to be considered (e.g., pacing, use of additional materials, comprehension of specific objectives).

Construction of the SLERS occurred in several stages. The first stage involved the initial generation of teacher and student behaviors related to the inductive teaching strategy and the creation of a classroom environment that is supportive to the development of problem-solving ability. Several behaviors were also included to take into consideration the teacher's ability to adapt the curriculum to the classroom. Five members of the staff of the Curriculum Research and Development Center served as judges in decision-making concerning the initial content validity of the behaviors.

The next stage consisted of observations of several New York City classes which were field testing Function V of the SLC.[2]

The purposes of these observations were to verify the occurrence of the behaviors derived from the SLC teaching model and to identify additional behaviors which needed to be included. No actual data were collected. These behaviors were discussed with the classroom teachers to provide feedback to them and to gain additional ideas and information relevant to the construction of the scale.

In the next stage, generated behaviors were translated into specific items. Items were written to meet two criteria: first, the behavior which they represented should be observable and, second, they should relate to at least one aspect of the model of implementation described previously. Rating criteria for each item considered both the frequency and quality of the observed behavior. Examples were written both to define the item and to provide a basis for rating the item. See Warshow and Bepko (1974) for further discussion.

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[2] Function V deals with teaching students to communicate effectively.

The items were then refined on the basis of further classroom observations. Some items were eliminated where there were redundancies. Additional items were added to take into consideration events observed in the classroom which typified the constructs in question. During this stage, less facilitative work was done with teachers. This final phase was also employed by the SLERS developers to establish sufficient quality control in terms of inter-rater reliability and calibration to provide a basis for the training of the outside observers discussed in the next section of the monograph.

A final selection of items was conducted to eliminate those items which represented behaviors both unlikely to occur and not crucial to the model. The items were then organized into the pilot version of the Social Learning Environment Rating Scale. Items were organized around the major objectives of the SLC, critical thinking and independent action, and a third area, teacher use of the curriculum, to represent those behaviors which were deemed important to the adaptation of the curriculum to individual teachers and classrooms. This organizational mode was used because of its logical consistency, conceptual clarity, and relevance to the reality of classroom behaviors.

DESCRIPTION OF THE SLERS

The resulting version of the SLERS was a sixty-item instrument organized for convenience into a teacher subscale and a pupil subscale. There are some parallel items in each subscale. Specifically, certain items regarding teaching behavior lead to a logical expectation of analagous pupil behavior.

Each item is rated on a scale of 1 to 5, with 5 being the highest rating. A rating of 1 corresponds to "never," 2 = "rarely," 3 = "occasionally," 4 = "frequently," and 5 = "almost never." Items are rated on the basis of the frequency and quality of the observed behavior.

The SLERS items can essentially be characterized as "high inference" as opposed to "low inference" (Rosenshine, 1970). This decision was made in order to insure adequate content validity of the items in relation to SLC objectives despite the possibility of a sacrifice in the inter-rater reliability of the items.

The teacher subscale is grouped into three sets: Critical Thinking, Independent Action, and Teacher Use (Management) of the Curriculum (see Table 1). Within the Critical Thinking and Independent Action sets, the items were organized into logical subsets, three for Critical Thinking and five for Independent Action.

The assumptions underlying the CT dimension for teachers were that successful use of the inductive teaching strategy would facilitate critical thinking in pupils (Category C) (Goldstein, 1969, 1974). In addition, the teacher's awareness of the individual learning styles of pupils (Category A) and his focusing on the problem to be solved (the objective of the experience) (Category B) would enhance the possibility of the occurrence of critical thinking.

There are five categories within the dimension of IA. Category A refers to the creation of a physical environment which encourages pupil participation. Category B takes into consideration social and psychological variables which may help or hinder problem-solving behavior. Category C takes into consideration the need for pupils to make judgments based on their own experience as a prerequisite for independent action. Category D considers the fact that social learning takes place within a social context and that pupils can assist each other in solving problems providing there is a supportive environment. Category E refers to pupils solving problems interdependently and cooperatively based on previously learned concepts. The greatest opportunity for independent action occurs at this stage of an experience.

TABLE 1

PILOT VERSION

SOCIAL LEARNING ENVIRONMENT RATING SCALE
TEACHER SUBSCALE

Critical Thinking (CT)

A. Teacher is aware of individual differences.

1. Acts upon differences in pupil learning style.

B. Focuses on the objective of the experience.

2. Understands objective (determined by what teacher does).
   a) Structures critical points in experience, rather than peripheral issues.
   b) Uses questions and activities that arrive at the objective determined by outline of what the teacher does.

3. Teacher implements experience by focusing primarily on task rather than self.

C. Uses the inductive problem-solving strategy.

4. Presents problems or has problems emerge related to the objective.

5. Has pupils label appropriately.

6. Assists pupils in separating relevant from irrelevant information with respect to the problem to be solved.

7. Restructures or gives relevant cues so that pupils can rethink problem (pupil mediation).

8. Provides opportunity for pupils to expand upon ideas.

9. Provides opportunity for pupils to make associations between ideas.

10. Allows time for reflection.

11. Provides opportunity for pupils to articulate alternative solutions to a problem.

12. Provides opportunity for pupils to predict consequences of alternative solutions to a problem.

13. Provides opportunity for pupils to try out solution(s) to a problem.

14. Provides opportunity for pupils to use concepts and skills previously acquired in a new or different situation - with teacher help.

TABLE 1 (continued)

Independent Action (IA)

A. Creates a physical environment that encourages and reflects pupil participation.

15. Provides activity centers or grouping arrangements where children can work in small groups or on individual projects.

16. Provides opportunity for different task-related activities to occur simultaneously.

17. There is evidence of student-made material in the classroom.

18. Allows pupils to move around room in nondisruptive activities.

19. Allows pupil use of resources and materials in classroom.

B. Takes into consideration inter- and intra-individual differences.

20. Allows pupils to express negative feelings (e.g., sadness, anger, frustration, and the like) that are not disruptive to the group.

21. Allows pupil expression of positive feelings (e.g., happiness, affection, pride) that are not disruptive to the group.

22. Acts upon differences in pupil personality.

C. Encourages pupils to use their own experience.

23. Acknowledges spontaneous interests of pupils where appropriate.

24. Draws on background and experiences of pupils.

D. Encourages pupil interaction.

25. Encourages pupils to be supportive of one another.

26. Encourages constructive pupil interaction (task related).

27. Asks one student to respond to another within a questioning strategy.

28. Teacher is supportive of pupils (uses appropriate reinforcement).

TABLE 1 (continued)

E. Encourages pupils to use the problem-solving strategy on their own.

29. Provides opportunity for individual pupils to show that they have learned or understood something by solving a problem related to task.

30. Provides opportunity for pupils to use concepts and skills previously acquired in a new or different situation - without teacher help.

31. Allows pupils to make their own decisions wherever possible.

Teacher Use (Management) of Curriculum (TC)

32. Implements objective primarily through activities (rather than verbalization) which give the child the experience of the objective.

33. Uses relevant additional activities to implement the objective of the experience.

34. Uses relevant additional materials to implement the objective of the experience.

35. Paraphrases within confines of objective rather than follows curriculum verbatim.

36. Changes activity when pupils begin to exhibit inattentive behavior (pacing).

37. Has pupils participate in distribution of materials (classroom management).

Teacher use of the curriculum is a dimension that takes into consideration how the teacher manages the curriculum. Does she follow the script verbatim, or does she adapt it to the needs of her pupils by paraphrasing or making additions?

Pupil subscale items were grouped into Critical Thinking and Independent Action sets (see Table 2). Within the CI and IA sets, the items were organized into subsets analagous to those in the teacher subscale.

Finally, Table 3 summarizes the breakdown of teacher and pupil items for each dimension and category.

AREAS OF INVESTIGATION

This monograph explores two separate, but related questions involving the SLERS. The first question deals with identifying and describing the primary qualities which define the instrument. In other words, what is the factor structure underlying the SLERS? Given the theoretical rationale behind the development of the instrument, two basic types of outcomes would appear reasonable. The first would suggest that the items would cluster around the dimensions of critical thinking (teacher and student), independent action (teacher and student), and teacher use of the curriculum. This finding would be consistent with the way the items are organized in the instrument itself. The second would suggest that the items should cluster around factors of Mass - Differentiation - Integration, each of which include some degree of critical thinking (teacher and student), independent action (teacher and student), and teacher use of the SLC.

The second question concerns itself with an attempt to account for observed differences in these primary qualities in terms of different classrooms and different SLC lessons. That is, what are the largest sources of variation between classes and among lessons.

TABLE 2

SOCIAL LEARNING ENVIRONMENT RATING SCALE
PUPIL SUBSCALE

Critical Thinking (C.T.)

B. Focuses on the objective of the experience.

38. Shows interest in the task and are generally attentive.

C. Uses the inductive problem-solving strategy.

39. Articulates problem(s) related to the objective.

40. Labels and details accurately.

41. Mediates own responses.

42. Expands on ideas.

43. Makes associations among ideas.

44. Shows evidence of reflecting before responding to a thought-provoking question or task.

45. Articulates (infers) alternative solutions to a problem.

46. Predicts consequences of alternative solutions to a problem.

47. Tries out (verfies) solution(s) to a problem.

48. Uses concepts and skills previously acquired in a new or different situation - with teacher help.

Independent Action (I.A.)

A. Creates a physical envirorment that encourages and reflects pupil participation.

49. Makes use of activity centers independently or in groups.

50. Works on different activities at the same time.

51. Moves around room in nondisruptive activities.

52. Uses resources and materials in the classroom.

TABLE 2 (Contined)

B. Takes into consideration inter- and intra-individual differences.

53. Expresses positive feelings.

54. Expresses negative feelings.

D. Encourages pupil interaction.

55. Is supportive of others (provides assistance, does not ridicule).

56. Interacts constructively with one another to solve a task-related problem.

E. Encourages pupils to use problem-solving strategy on their own.

57. Uses concepts and skills previously acquired in a new or different situation - without teacher help.

58. Works independently to solve a problem.

59. Participates in decision-making.

60. Asks questions unsolicited by teachers.

TABLE 3

TEACHER SUBSCALE	TOTAL ITEMS	PUPIL SUBSCALE	TOTAL ITEMS
Critical Thinking (CT)		Critical Thinking (CT)	
A. Is aware of individual differences.	1		1
B. Focuses on the objective of the experience.	2	B. Focuses on the objective of the experience.	
C. Uses the inductive problem-solving strategy.	11	C. Uses the inductive problem-solving strategy.	10
	14 Total		11 Total
Independent Action (IA)		Independent Action (IA)	
A. Creates a physical environment that encourages and reflects pupil participation.	5	A. Participates in activity by free use of material add space.	4
B. Takes into consideration inter- and intra-individual differences.	3	B. Expresses individual differences.	2
C. Encourages pupils to use their own experience.	2		
D. Encourages pupil interaction.	4	D. Interacts.	2
E. Encourages pupils to use the problem-solving strategy on their own.	3	E. Uses the problem-solving strategy on their own.	4
	17 Total		12 Total
Teacher Use (Management) of Curriculum			
Six items	6		
Total Teacher Items	37	Total Pupil Items	23

A related question is concerned with the practical consequences of the sources of variation previously identified that would produce information relevant to the development, implementation, and revision of the SLC. That is, given certain absolute sources of differences, to what degree are the factors actually present in the lessons and to what degree are factors implemented in the classrooms? Is it possible that certain factors (behaviors) are present to a greater degree in some classes or lessons while other behaviors are more prevelent in different classes or lessons?

SECTION II: PROCEDURES AND METHODOLOGY

Raymond A. Beppo, Joyce P. Warshow, Gregory Schimoler and I. Leon Smith

OBSERVER TRAINING

Three observers were trained in the use of the SLERS for the purpose of data collection. The observers were graduate students in special education and educational psychology. All had some teaching experience. Training occurred over a four-month period and included the generation and discussion of examples for each SLERS item. The examples were taken from classroom observations made during the initial construction of the scale discussed in the preview section and during the actual observers' training. The trainees also rated existing audio and video tapes of teachers field testing various functions of the SLC. The major portion of the training consisted of actual classroom observations of the classes which were to participate in this study.[3] Thus, both the classes and the observers become familiar with each other. The observers were trained in the logistics of classroom research. Questions were resolved regarding approach to teachers, the kind of feedback information allowable, and interaction with students. A guideline for observers was prepared and weekly meetings were held to discuss issues which arose during the practice observations (see Table 4). A total of twenty-five practice observations were made. The discussions served to facilitate concurrence in assessing specific items. Initial quality control data was also generated in three different classrooms in order to provide an empirical basis for the training of the observers or judges.

Table 5 contains the means, standards deviations, intercorrelations, and percentages of agreement among the three observer-judges ($O\text{-}J_1$; $O\text{-}J_2$; $O\text{-}J_3$) and one of the SLERS Developers (D).

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[3] The SLC lessons, however, were not the ones actually observed during the conduct of the study.

Additional training was then undertaken in order to clarify discrepancies suggested by the analyses. These discrepancies were not unexpected, however, given the "high inference" nature of the instrument (Rosenshine, 1970).

SAMPLE DESCRIPTION

The sample consisted of seventeen intermediate-level EMR classrooms located in New York City. Classroom size varied from a minimum of seven to a maximum of fifteen and the students ranged in age from nine to fourteen. Seven of the classes had participated in the early stages in the development of the SLERS described in the previous section and/or the collection of quality control data for the purpose of training the observers. Ten additional classes were added in order to conduct the study related herein. All but two of the classes had participated previously in the field testing of various Phases and Functions of the SLC.

DATA COLLECTION

The seventeen classes were observed implementing six experiences (lessons) from Function VII (Emotional Security) of the SLC. These six experiences were chosen by the curriculum developers as representative of the total function, which consisted of twenty-three experiences. The six observed experiences were written, like all SLC material, from a M-D-I model and included critical thinking and independent action objectives to be achieved in connection with the inductive teaching methodology. The three observers were assigned on a random basis to specific classes. Although randomization of observers was the goal, this could not be completely achieved because of logistical complications. A total of one hundred observations were made over a four-month period. See Figure 2 for a layout of these observations.

TABLE 4

Guidelines for Observers

1. Teacher and pupil ratings should be considered independently of each other. Teacher may cue without a response from pupil or pupil behavior may occur independent of teacher behavior.
2. Ratings are based on what occurs during the period of SLC observation only.
3. Ratings are scored on a scale of 1 to 5. Both quantity and quality of behavior are considered in the rating.
4. Observers should be as unobtrusive as possible in the classroom. They should interact as little as possible with students.
5. Observers are to follow school rules (e.g., signing a guest book, reporting to the office).
6. Be prepared to provide feedback to teachers if requested, but not regarding specific SLERS items.
7. Teachers should be notified in advance as to the date and time of observation, and to any recording equipment that may be used.
8. Observers should be sufficiently familiar with the SLERS items so that they may take notes keeping these items in mind. The rating scale should be filled out immediately after the observation. Ratings made after a 24-hour period are invalid.

Table 5

Means, standard deviations, intercorrelation, and percentage of agreement among three observer-judges and one scale developer.

	Class One[a]					Class Two[b]					Class Three[c]			
	$O\text{-}J_1$	$O\text{-}J_2$	$O\text{-}J_3$	D		$O\text{-}J_1$	$O\text{-}J_2$	$O\text{-}J_3$	D		$O\text{-}J_1$	$O\text{-}J_2$	$O\text{-}J_3$	D
$O\text{-}J_2$	.59 49%	-	-	-	$O\text{-}J_2$	.63 49%	-	-	-	$O\text{-}J_2$	.54 49%	-	-	-
$O\text{-}J_3$	.74 53%	.69 51%	-	-	$O\text{-}J_3$	.63 43%	.61 56%	-	-	$O\text{-}J_3$	.88 56%	.72 41%	-	-
D	.75 53%	.52 53%	.69 44%	-	D	.83 58%	.68 58%	.56 48%	-	D	.52 42%	.51 37%	.48 42%	-
$\bar{X}$	2.3	2.4	2.5	2.1	$\bar{X}$	2.5	2.4	2.6	2.2	$\bar{X}$	2.7	2.4	3.1	2.3
SD.	1.3	1.5	1.4	1.2	SD.	1.5	1.2	1.2	1.3	SD.	1.5	1.7	1.5	1.5

Note - Data presented above are intended to summarize the actual procedures employed. Individual item as well as teacher vs. student item analyses were also examined and can be obtained upon request from the author. Upper values refer to the correlation, lower values refer to the percentage agreement.

[a] Observations based on Experience 10, Function VI of the SLC.

[b] Observations based on Experience 5, Function VI of the SLC.

[c] Observations based on Experience 17, Function I of the SLC.

Figure 2

Assignment of Observer-Judges by Class and Experience

Experiences (Lessons)

Classes	1	2	3	4	5	6
1	$O\text{-}J_1$	$O\text{-}J_3$	$O\text{-}J_2$	$O\text{-}J_3$	$O\text{-}J_2$	$O\text{-}J_3$
2	$O\text{-}J_3$	$O\text{-}J_1$	$O\text{-}J_1$	$O\text{-}J_1$	$O\text{-}J_1$	$O\text{-}J_3$
3	$O\text{-}J_3$	$O\text{-}J_1$	$O\text{-}J_2$	$O\text{-}J_1$	$O\text{-}J_1$	$O\text{-}J_1$
4	$O\text{-}J_3$	$O\text{-}J_3$	$O\text{-}J_3$	$O\text{-}J_3$	$O\text{-}J_2$	$O\text{-}J_2$
5	Not Observed	$O\text{-}J_2$	$O\text{-}J_2$	$O\text{-}J_3$	$O\text{-}J_3$	$O\text{-}J_3$
6	$O\text{-}J_1$	$O\text{-}J_1$	$O\text{-}J_3$	$O\text{-}J_1$	$O\text{-}J_1$	$O\text{-}J_2$
7	$O\text{-}J_2$	$O\text{-}J_2$	$O\text{-}J_2$	$O\text{-}J_1$	$O\text{-}J_3$	$O\text{-}J_3$
8	$O\text{-}J_1$	$O\text{-}J_1$	$O\text{-}J_3$	$O\text{-}J_2$	$O\text{-}J_2$	$O\text{-}J_1$
9	$O\text{-}J_2$	$O\text{-}J_3$	$O\text{-}J_3$	$O\text{-}J_2$	$O\text{-}J_3$	$O\text{-}J_1$
10	$O\text{-}J_1$	$O\text{-}J_2$	$O\text{-}J_1$	$O\text{-}J_2$	$O\text{-}J_3$	$O\text{-}J_2$
11	$O\text{-}J_3$	$O\text{-}J_3$	$O\text{-}J_1$	$O\text{-}J_1$	$O\text{-}J_3$	$O\text{-}J_2$
12	$O\text{-}J_1$	$O\text{-}J_2$	$O\text{-}J_3$	$O\text{-}J_3$	$O\text{-}J_2$	$O\text{-}J_1$
13	$O\text{-}J_2$	$O\text{-}J_3$	$O\text{-}J_1$	$O\text{-}J_3$	$O\text{-}J_2$	$O\text{-}J_1$
14	$O\text{-}J_3$	$O\text{-}J_1$	$O\text{-}J_1$	$O\text{-}J_2$	$O\text{-}J_2$	$O\text{-}J_1$
15	$O\text{-}J_1$	$O\text{-}J_2$	$O\text{-}J_2$	$O\text{-}J_3$	$O\text{-}J_1$	$O\text{-}J_1$
16	$O\text{-}J_2$	$O\text{-}J_2$	$O\text{-}J_2$	$O\text{-}J_3$	$O\text{-}J_2$	$O\text{-}J_3$
17	$O\text{-}J_2$	$O\text{-}J_1$	$O\text{-}J_2$	$O\text{-}J_3$	$O\text{-}J_2$	Not Observed

During the observations, the O-J's recorded information relevant to each item. Immediately after each observation, the O-J's rated the teacher and pupils on each item. As an additional quality control check, one of the scale developers made three independent but concurrent observations with each of the three O-J's.

Prior to the data collection, teachers were informed by letter that the purpose of the observations was to determine how different teachers implement the same curriculum materials. It was explained that this was necessary in order to provide feedback to curriculum writers for the revision of the materials and suggestions for future curriculum development. Teachers were asked to remind their students that visitors were coming to see how different classes were working with the curriculum and that there would be microphones to record what was happening. Reaction to the observers by the students was minimal since all of the classes had been observed prior to data collection by curriculum center staff.

DATA ANALYSIS

Factor Anslysis

Unit of Analysis

Since the implementation of the SLC is viewed as the interaction of the teacher, students and curriculum, the appropriate unit of analysis for this study was defined as the class. In other words, only a factor analysis of teacher and pupil behaviors together would yield evidence regarding the potential validity of the SLERS and the accuracy of the SLC model of implementation, since both the instrument and the model assume an ongoing interaction between teacher and student.

Method of Analysis

The factor structure of the SLERS was examined through the application of a principal components analysis, followed by varimax rotations (Veldman, 1967). The data for this analysis consisted of the one hundred observations (classes x experiences as in Figure 2) across the sixty SLERS items.

First, this data was used to compute the 60 x 60 inter-item correlation matrix (R). In the principal components stage of this analysis, the correlation matrix was used to extract, based on the least-squares criterion, f orthogonal (independent) principal components. Thus the first principal component extracted can be thought of as being a vector of item loadings which if multiplied by the matrix of item standard scores would result in a vector of factor scores accounting for the largest proportion of variance possible in the inter-item correlation matrix. The 2nd and 3rd ...fth principal components were similarly computed with the constraint that they must be orthogonal (independent or uncorrelated) with the preceding principal components(s). For the purposes of this analysis the number of principal components extracted is determined by a joint criterion of the amount of variance the principal component accounts for and the degree of fit to the theoretical constructs assumed to underlie the SLERS.

After the f principal components were extracted, these factors were rotated to simple structure using the varimax criterion. This procedure maximizes the variance in all f factors, such that the amount of variance attributed to each factor is as large as possible. In effect this rotation procedure minimizes the importance of the G-factor (1st principal component) by spreading the variance as equally as possible between the f factors.

At this stage some factor analysts (cf. Harmon, 1960) recommend oblique (correlated) rotations. The advantage of this procedure is that oblique factors are sometimes more readily interpretable since they may more accurately reflect the real-life situation where psychological constructs are indeed hypothesized to be correlated. However, allowing factors to be correlated presents two problems: 1) f oblique factors will always account for less of the total variance than f orthogonal factors, since there is redundant, common variance in each of the f factors, and 2) oblique factors are less stable than orthogonal factors. The use of oblique factors was decided against in this study since the factors were to be used in later analyses and it was desirable to retain the largest amount of the original variance in the fewest number of factors, and also because the sample size of one hundred was considered too small to risk a less stable solution which could prove difficult to replicate. Thus a varimax solution was considered to be the more appropriate procedure for this study.

Finally, the varimax rotations produced a f factor x k item loading matrix. This matrix was used to interpret the meaning of the factors. To produce factor scores for each of the observations across the f factors, the varimax loading matrix was normalized to produce a varimax weights matrix. This is done simply to ensure that the resulting factor scores have a mean of 0 and a standard deviation of 1. The factor scores are then generated according to the following formula:

$$S_{ij} = \sum_{k=1}^{k} z_{ik} w_{jk}$$

The factor score(s) for the ith observation on the jth factor is the weighted (w) sum of the standard score (z) of the ith observation on the kth item. This procedure results in f factor scores for each of the one hundred observations.

Components of Variance Analysis

Specific sources of variation inherent in the instrument were identified through the application of a components of variance analysis (Medley & Mitzel, 1963; Cronbach et al., in press; McGaw et al., 1973; Lindquist, 1953). This procedure permits the simultaneous examination of many sources of the variability employing an analysis of variance model. A general data layout for the design is presented in Figure 3. An estimate of specific sources of variation or variance components in the design was obtained from a completely fixed, three-way (Classes x Lessons x Factors) analysis of variance (ANOVA) with one observation per cell. The model for the analysis was

$$/\underline{T}/\ X_{ijmn} = m + C_i + L_j + F_m + CL_{ij} + CF_{im} + LF_{jm} + CLF_{ijm} + E_{ijmn}$$

where m is a general mean, C_i, L_j, and F_m refer to the main dimensions of Classes, Lessons and Factors, respectively, and E_{ijm} is specific error. The third dimension in the design was based on the reduced set of factors (f) obtained from the previous analysis. That is, for each lesson, each class was assigned f factor scores based on weighted, linear combinations of the original items comprising the instrument. Both the original item scores and each of the f sets of factor weights were standardized before the linear combinations were calculated. The distributions (mean, standard deviation) of each of the f factors across lessons and classes were identical, thereby artificially setting the source of variation due to factors alone at zero. The dimension had to be included, however, in order to examine the sources of variation involving the interaction of the factors with both lessons and classes.

In terms of partitioning the variance provided by the analysis, then,

/2/ $\sigma^2_X = \sigma^2_C + \sigma^2_L + \sigma^2_F + \sigma^2_{CL} + \sigma^2_{CF} + \sigma^2_{LF} + \sigma^2_{CLF} + \sigma^2_E$.

Since there was only one observation per cell, $\sigma^2_{CLF} + \sigma^2_E$, was estimated as σ^2_{RES}. The expected mean squares, based on fixed effects assumptions, are presented in Table 6, and estimates of each component are contained in Table 7.

Implementation and Lesson Analysis

The sources of variation identified in the previous analyses were additionally examined in a way that would provide more direct information regarding the differential presence of the underlying factors in the lessons as well as the differential occurrence or implementation of the factors in the classes. This was accomplished by going back to the raw scores (1 = infrequently observed; 5 = frequently observed) for the specific item sets underlying each factor and computing their over-all mean for each of the classes and each of the lessons. A low mean for items of a factor with respect to the lessons would tend to indicate that the particular factor was infrequently present in the lesson, while a low mean for the items of a factor with respect to the classes would indicate that it occurs infrequently in the classes.

Figure 3

Data Layout for the Design

Factor C	Classes	i = 1, 2, ...17.
Factor L	Lessons	j = 1, 2, ...6.
Factor F	Factors	m = 1, 2, ...f.

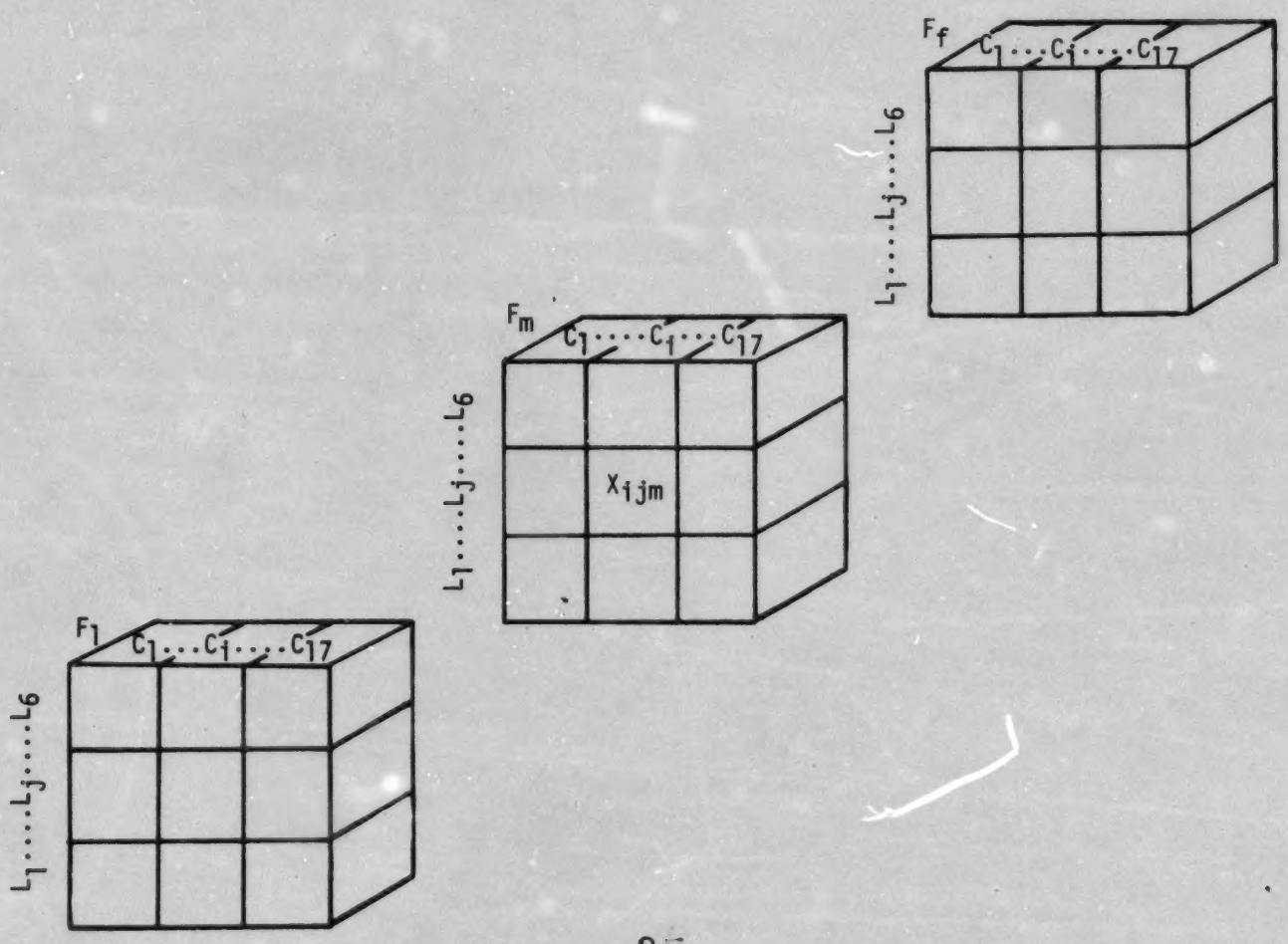

Table 6

Expected Mean Squares

Source of Variation	E(MS)
Classrooms - C	$\sigma_E^2 + 6f\sigma_C^2$
Lessons - L	$\sigma_E^2 + 17f\sigma_L^2$
Factors - F	$\sigma_E^2 + 102\sigma_F^2$
C x L	$\sigma_E^2 + f\sigma_{CL}^2$
C x F	$\sigma_E^2 + 6\sigma_{CF}^2$
L x F	$\sigma_E^2 + 17\sigma_{LF}^2$
Residual	$\sigma_E^2 + \sigma_{CLF}^2$

Table 7

Variance Components

$\hat{\sigma}^2_C$ =	$1/6f\ (MS_C - MS_{Res})$
$\hat{\sigma}^2_L$ =	$1/175\ (MS_L - MS_{Res})$
$\hat{\sigma}^2_F$ =	$1/102\ (MS_F - MS_{Res})$
$\hat{\sigma}^2_{CL}$ =	$1/f\ (MS_{CL} - MS_{Res})$
$\hat{\sigma}^2_{CF}$ =	$1/6\ (MS_{CF} - MS_{Res})$
$\hat{\sigma}^2_{LF}$ =	$1/17\ (MS_{LF} - MS_{Res})$
$\hat{\sigma}^2_{Res}$ =	MS_{Res}

Note - Estimates of the sources of variation based on the fixed effects model are very conservative, i.e, lower-bound estimates. That is, while none of the sources have σ^2_{CLF} (see Table 6) in their E(MS), the value for it is subtracted out anyway because it cannot be separated from σ^2_E when there is one subject per cell. Thus, the components are to some degree "overcorrected" and underestimated.

SECTION III: ANALYSIS AND RESULTS

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PRELIMINARY ANALYSES AND RELIABILITY CHECK

A preliminary analysis of the means and standard deviations of the SLERS revealed that two items (16 and 49) had a zero frequency of occurrence. These items were eliminated from the factor analysis resulting in an item pool of 58 rather than 60 items.

During the course of the gathering of the data for this study, one of the SLERS developers went out three times with each of the three O-J's to observe a class. A total of nine observations were made during the data collection period for the purpose of reliability check. Table 8 reports the intercorrelations between the O-J and the SLERS developer for these nine observations. These correlations are comparable to those obtained during the O-J training period (see Table 5), indicating variable levels of reliability as well as some observer-judge bias for this high-inference measure. This effect is best illustrated in Table 5, where it was seen that despite a high level of agreement between the observer-judges on a given observation, the mean response for the three observer-judges differs somewhat. This implies that different observer-judges may be using different parts of the 1-5 rating scale to describe the same phenomenon. Thus, for example, one observer-judge may mean the same thing by a rating of 4 as another observer-judge may mean by a rating of 3.

This issue of observer bias is a crucial issue in the analysis of the SLERS since the one hundred observations were to be used as the unit of analysis. Approximately a third of the observations were done by each of the three observer-judges. If one of the O-J's were a consistently high rater, another a consistently moderate rater, and another a consistently low rater, simply

TABLE 8

CORRELATIONS BETWEEN JUDGES AND DEVELOPER AT THREE TIMES FOR EACH OF THREE OBSERVATIONS WITH THREE OBSERVER-JUDGES (O-J)

	$O\text{-}J_1$	$O\text{-}J_2$	$O\text{-}J_3$
T_1	.600	.699	.799
T_2	.766	.442	.727
T_3	.688	.665	.524

knowing who the rater was would to some degree determine what the rating on a given observation for any given item would be. This O-J bias effect would then also effect the inter-item correlations, and ultimately the factor analysis of the SLERS.

In an effort to control for this O-J bias, it was decided to standardize SLERS items within each of the three O-J's. For each of the fifty eight items to be used to compute the inter-item correlation matrix, the mean and standard deviation for each of the three O-J's was computed and used to generate a new score standardized for any O-J bias. Thus the new score for a given observation (i) made by O-J (j) on a given item (k) may be expressed:

$$z_{jik} = \frac{x_{jik} - \bar{x}_{jk}}{\sigma_{jk}}$$

This results in a new data matrix standardized within O-J's which is independent of any O-J effect which might be present. This data matrix was then used to compute inter-item correlation for factor analysis.

FACTOR ANALYSIS AND INTERPRETATION

Standardized scores for fifty-eight SLERS items were factor analyzed according to the procedure previously described. Several solutions were computed, varying the number of factors extracted and rotated from two up to ten.

One of the major purposes of this investigation was to determine whether actual class implementation of the Social Learning Curriculum was consonant with its theoretical rationale. It was felt that an examination of the factor structure of the SLERS would provide evidence regarding this issue. A five-factor solution was arrived at as the optimal solution based on a relatively equal spread of the variance across the five factors and this solution's

compatibility with the hypothetical model previously described. Logical interpretation of this empirical data required the comparison of the factor solution with the theoretical model depicted schematically in Figure 1. This process involved the resolution of several questions regarding the model, the original item classification, and the items defining each factor.

Prior to the investigation, two general, alternative hypotheses were postulated regarding the predicted clustering of SLERS items into factors. One hypothesis predicted that items would cluster into categories and subcategories around the curriculum objectives of critical thinking and independent action and a third dimension, teacher use of the curriculum. The other possibility was that SLERS items would cluster into three dimensions representing the Mass, Differentiation, and Integration process prescribed for the implementation of the SLC. Both alternatives assumed that the inductive teaching method would be evident in the factor structure in the manner specified by Greenberg and Smith (1974) and discussed earlier in this monograph.

The factor solution generated through the data analysis provided partial support for both hypotheses but did not indicate that either alternative can be fully accepted or rejected.

Each of the five factors consisted primarily of items related to the critical thinking objective or the independent action objective. There was little overlap of CT and IA related items on any individual factors. However, the items did not group into the CT and IA subcategories anticipated in the organization of the scale (see Tables 1 and 2). There were three factors which could be considered related to critical thinking and two related to independent action. Teacher use of curriculum did not appear as a separate factor. Furthermore, the two factors related to independent action qualitatively differed. One of these reflected the concept of independent action as

originally defined, i.e., the items suggested that students were applying the problem-solving strategy independently of the teacher (although within situations provided by her). The independent action items defining the other factor refer to the physical, social and psychological aspects of the environment. Therefore, the first hypothesis regarding the clustering of items around CT, IA, and TC dimensions, did not appear to be fully supported by the data. Additionally, the discrepancy between the two IA factors suggested that the original classification of items into CT, IA, and TC groupings needed to be reexamined.

The second hypothesis predicted that the SLERS items would cluster into factors representing the Mass, Differentiation, and Integration stages and that the components of the CT and IA strategies would fall within these stages. Figure 1 (the SLC Teaching Process Flow), as described in the first section of the monograph, shows the theoretical relationship between Mass, Differentiation, and Integration and the teaching strategies designed to facilitate student attainment of critical thinking and independent action objectives. The obtained factor structure gives support to the conceptualization of problem solving as represented by Mass, Differentiation, and Integration. However, the five-factor solution, as well as the composition of the factors themselves, suggest the existence of a process more complex than the original conceptualization. It would appear that an additional, affectively-oriented dimension must be considered, particularly in light of the items which define Factor 3.

The inductive teaching strategy is a five-step hierarchical sequence from labeling through generalization. With one significant exception, the items specific to the inductive strategy defined different factors in the expected sequential fashion. The exception occurred in the first factor. The appearance

of three prediction/verification items, representing a later step in the strategy, with labeling and detailing items, representing earlier steps, presented a problem of interpretation. Therefore, the second hypothesis could not be fully supported.

In summary, the interpretation of the factor structure had to resolve three basic issues: the definition of the factors with respect to critical thinking and independent action, the clarification of the M-D-I process, and the meaning of the appearance of items related to early and late steps of the inductive hierarchy on the same factor.

FACTOR STRUCTURE

The five-factor solution and factor description of characteristic items is presented below.

Factor 1[4]: Problem Emergence

This factor is characterized primarily by critical thinking items (see Table 9). The highest loading items represent the labeling and detailing steps of the inductive hierarchy. The teacher, from her understanding of the objective of the lesson, structures the lesson to focus the student's attention on the emerging problem. She has her students label the various parts of the problem and assists them in separating relevant from irrelevant information. The teacher acts upon differences in pupil learning style and encourages students to be supportive of one another. Students are generally attentive and interested in the task, label and detail appropriately and are supportive of one another.

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[4]Factors are presented in their logical order, not in the order of extraction. The order of extraction and percentage of variance accounted for was as follows: Factor One (12.62%), Factor Three (6.79%), Factor Five (10.08%), Factor Two (6.13%), and Factor Four (9.61%). The total percentage of variance accounted for was 45.23%. Factor identification was based on items with loadings in excess of .4.

This factor depicts the teacher as a directive force, serving as an active guide, orienting students towards the problem within a structure designed to facilitate its emergence. Students do not play as active a role as the teacher (evidenced particularly by the negative load of item 57). The appearance of items 11, 12, and 44 in Factor 1 present a problem of interpretation. One would not expect the occurrence of prediction/verification items until much later in the problem-solving process and these items do not quite "fit" the factor "picture" drawn in the preceding paragraph. A possible explanation for this phenomenon is that there must be an awareness that a problem exists before it can be solved. This awareness would logically occur as the problem itself emerges through the teacher's use of the full range of inductive questioning. From this viewpoint then, becoming aware of the existence of the problem is itself subject to an inductive problem-solving strategy. A second explanation for the Factor 1 appearance of prediction/verification items focuses on teachers' tendencies to review the previous lesson at the beginning of a new lesson. It is likely that in the course of this review the teacher and/or students would focus on alternative solution(s) to that lesson's problem(s).

Factor 2: Problem Clarification

This factor is also characterized primarily by critical thinking items depicting the part of the teaching-learning transaction dealing with the analysis and clarification of the problem (see Table 10). The teacher's relevant cueing and utilization of the students' experience provides the stimulus for students to further analyze the problem components. She gives students the opportunity and the cues to make inferences and to expand upon their ideas. Students identify relevant problems, make inferences, and mediate their own responses. Factor 2 also reflects student expression of negative feelings. (Expression of

Table 9

Factor 1: Problem Emergence

Teacher		Student	
Item Number	Loading	Item Number	Loading
6	.67	39	.65
3	.63	44	.58
2	.59	57	-.46
4	.58	54	.45
5	.57	37	.44
11	.56		
1	.53		
34	.50		
24	.46		
12	.41		
9	.41		

Factor 1 Items

Teacher

6.	Assists pupils in separating relevant from irrelevant information with respect to the problem to be solved.	(CT)
3.	Implements experience by focusing primarily on task rather than self.	(CT)
2.	Understands objective (determined by what teacher does);	
	a) Structures critical points in experience rather than peripheral issues.	(CT)
	b) Uses questions and activities that arrive at the objective.	
4.	Presents problems or has problems emerge related to the objective.	(CT)
5.	Has pupils label appropriately.	(CT)
11.	Provides opportunity for pupils to articulate alternative solutions to a problem.	(CT)
1.	Acts upon differences in pupil learning style.	(CT)
34.	Paraphrases within confines of objective rather than follows curriculum verbatim.	(TC)
24.	Encourages pupils to be supportive of one another.	(IA)
12.	Provides opportunity for pupils to predict consequences of alternative solutions to a problem.	(CT)
9.	Provides opportunity for pupils to make associations among ideas.	(CT)

Students

39.	Label and detail appropriately.	(CT)
44.	Articulate alternative solutions to a problem.	(CT)
57.	Participate in decision-making.	(IA)
54.	Are supportive of one another.	(IA)
37.	Show interest in task and are generally attentive.	(CT)

Note:- CT and IA refer to critical thinking and independent action.

positive feelings also contributed to this factor, but at a loading less than the .40 criterion.) This item is the only independent action related item appearing in Factor 2. Its occurrence here may indicate the importance of pupil expression of affect during the problem clarification stage.

Factor 3: Problem Resolution

This factor is also defined primarily by items related to critical thinking (see Table 11). The teacher provides students with the opportunity to articulate alternative solutions to the problem, explore their possible consequences, and verify the solution which they predict will work. The students, working together, abstract a rule or concept which is then applied, with the aid of the teacher, to a new problem situation.

Factor 3 reflects the final steps in the inductive sequence leading to the generalization by students of rules which may be applied to similar problem situations. The teacher still directly facilitates the learning while students are beginning to play a more active role in the process as the original problem is resolved.

In fact, Factor 3 items are distinguishable from the items related to the next factor, application of learning, in that the former relate to the student in a respondent role, while the latter refer to the student in a more operant role. The term, respondent, is used here to indicate that classroom activity is primarily under the control of the teacher, while, operant, describes classroom activity at least partially under the control of the students. That is, in Factor 3 the student "responds" more under the supervision of the teacher, while in Factor 4, the student "operates" more independently. In the respondent mode, questions and activities provided by the teacher are responded to by the student and/or the class as a whole. The teacher is more actively involved in directing activities in which a generalization is applied by pupils. Factor 4 items, on the other hand, are characterized by a more operant mode of

Table 10

Factor 2: Problem Clarification

Teacher		Student	
Item Number	Loading	Item Number	Loading
9	.57	42	.63
23	.57	38	.49
7	.49	40	.42
8	.45	53	.42
5	.42		

Factor 2 Items

Teacher

9.	Provides opportunity for pupils to make associations between ideas.	(CT)
23.	Draws on background and experiences of pupils.	(CT)
7.	Restructures or gives relevant cues so that pupils can rethink problem (pupil mediation).	(CT)
8.	Provides opportunity for pupils to expand upon ideas.	(CT)
5.	Has pupils label appropriately.	(CT)

Students

42.	Make associations among ideas.	(CT)
38.	Articulate problems related to the objective.	(CT)
40.	Mediate own responses.	(CT)
53.	Express negative feelings.	(IA)

Note: - CT and IA refer to critical thinking and independent action respectively.

Table 11

Factor 3: Problem Resolution

Teacher		Student	
Item Number	Loading	Item Number	Loading
14	.66	47	.66
13	.64	46	.65
12	.61	45	.57
31	.45	55	.47

Factor 3 Items

Teacher

14. Provides opportunity for pupils to use concepts and skills previously acquired in a new or different situation - with teacher help. (CT)
13. Provides opportunity for pupils to try out solutions to a problem. (CT)
12. Provides opportunity for pupils to predict consequences of alternative solutions to a problem. (CT)
31. Implements objective primarily through activities (rather than verbalization) that give the child the experience of the objective. (TC)

Students

47. Use concepts and skills previously acquired in a new or different situation - with teacher help. (CT)
46. Try out solutions to a problem. (CT)
45. Predict consequences of alternative solutions to a problem. (CT)
55. Interact constructively to solve a task related problem. (IA)

Note: - CT and IA refer to critical thinking and independent action.

Table 12

Factor 4: Application of Learning

Teacher		Student	
Item Number	Loading	Item Number	Loading
28	.78	56	.74
36	.75	48	.68
29	.68	51	.68
18	.65	49	.56
33	.46	50	.44
32	.45		
17	.42		

Factor 4 Items

Teacher

28. Provides opportunity for individual pupils to show that they have learned or understood something by solving a problem related to the task. (IA)
36. Has pupils participate in distribution of materials (classroom management). (TC)
29. Provides opportunity for pupils to use concepts and skills previously acquired in a new or different situation - without teacher help. (IA)
18. Allows pupil use of resources and materials in the classroom. (IA)
33. Uses relevant additional materials to implement the objective of the experience. (TC)
32. Uses relevant additional activities to implement the objective of the experience. (TC)
17. Allows pupils to move around room in nondisruptive activities. (IA)

Students

56. Work independently in solving a problem. (IA)
48. Use concepts and skills previously acquired in a new or different situation - without teacher help. (IA)
51. Use resources and materials in the classroom. (IA)
49. Make use of activity centers independently or in groups. (IA)
50. Move around room in nondisruptive situations. (IA)

Note: - CT and IA refer to critical thinking and independent action.

instruction, where the environment is arranged in such a way that pupils apply a problem-solving strategy with a greater degree of independence. The difference between Factor 3 and Factor 4 items then, is not that one is more verbal and the other more active. On the contrary, one of the items in Factor 3 indicates that the teacher implements the objective primarily through activities rather than through verbalization. In this way pupils gain the experience which is preparatory to his functioning within the operant mode (see Factor 4 below).

Factor 4: Application of Learning

This factor is characterized by items relating to independent action as originally defined, i.e., the application of a problem-solving strategy without undue reliance on others (see Table 12).

The teacher encourages student participation and independent use of the problem-solving strategy by providing additional relevant activities and materials, giving individuals the opportunity to demonstrate their new learning by solving a task related problem, and allowing students to use the full resources and materials of the classroom.

Students demonstrate the problem-solving strategy by working independently, utilizing classroom resources, activity centers, and materials, and applying the concepts and skills previously generalized to new problem situations. The full participation of students in the teaching-learning process is reflected in Factor 4. This factor is probably the best predictor of the ability to generalize social learning skills from the SLC to functioning in other situations, or in adult life. The child must apply a generalization understood from specific content within a lesson, demonstrate that he can use a problem-solving strategy on his own, and use the resources available to him.

Factor 5: The Social Learning Environment

This factor (see Table 13) is defined by items originally classified as related primarily to independent action. However, these items,as mentioned earlier, appear to be qualitatively different from the independent action items in Factor 4. Factor 5 is indicative of an affective environment. It depicts a background in which the problem-solving process and application of learning reflected in the other factors, is facilitated.

Essentially, the teacher arranges and manages the physical, social and psychological aspects of the environment. There is freedom of movement within the classroom and pupils participate in decision making.

The teacher creates a psychological environment which reflects a respect for individual differences, interests, ideas, and feelings, and encourages pupils to be supportive of each other. This supportiveness sets the tone for constructive pupil interaction.

When the teacher implements the objective primarily through activities rather than through verbalizations, she is reflecting the position that pupils should be encouraged to trust their own experiences and to learn from them. That pupils are encouraged to interact to solve a problem reflects the assumption on the part of the teacher that pupils can learn from each other.

This is further demonstrated when the teacher asks one student to respond to another within a questioning strategy.

It should be noted that the two highest loading items on Factor 5 reflect the expression of emotion. It is not known to what extent this is content specific, given the focus on emotional security in the SLC Function in use at the time this data was collected. However, the definition of this factor by affective items (other than those dealing specifically with the expression of feelings) would tend to indicate that the social learning environment would be a factor in the implementation of all SLC materials.

SUMMARY OF FACTOR ANALYSIS

An examination of the factors generally supports the conceptualization of the Mass, Differentiation, Integration flow originally depicted in Figure 1. However, the process is further clarified by these factors, as indicated in Figure 4. Factor 1, Problem Emergence, corresponds to the Mass stage. Factors 2 and 3, Problem Clarification and Problem Resolution, represent the Differentiation stage. Factor 4, Application of Learning, reflects the Integration stage. Student critical thinking and independent action, and the teaching behaviors which facilitate CT and IA are no longer considered separately. They are conceptualized as part of a gestalt which occurs within an enabling environment. Furthermore, student behavior is seen as moving from a respondent to an operant mode. In the respondent mode, the teacher is relatively more dominant in directing the learning activities. In the operant mode students are independent of the teacher in the sense that they can apply what they have learned without her direct guidance. The problem-solving process reflected in Factors 1, 2, 3 and 4 and facilitated in Factor 5 depicts the teacher gradually relinquishing direct control and the students assuming a more active role in their own learning.

What emerges from Figure 4 is a notion of teacher-learner transactions inherent in both the process and content of the Social Learning Curriculum. The teacher is involved in the learning process as a manager, director, or resource person according to the needs of her students and the demands of the curriculum. The nature of these transactions will change as the students gain skill and confidence. The general educational goal of these transactions is always the cognitive and affective independence of the students as they interact with others in social situations.

Table 13

Factor 5: The Social Learning Environment

Teacher		Student	
Item Number	Loading	Item Number	Loading
19	.67	50	.57
20	.62	55	.57
17	.58	52	.56
25	.58	53	.54
24	.53	54	.54
30	.52	57	.46
21	.52	41	.42
22	.47		
26	.42		
31	.40		

Factor 5 Items

Teacher

19. Allows pupils to express negative feelings. (IA)
20. Allows pupil expression of positive feeling. (IA)
17. Allows pupils to move around room in non-disruptive activities. (IA)
25. Encourages constructive pupil interaction. (IA)
24. Encourages pupils to be supportive of one another. (IA)
30. Allows pupils to make their own decisions wherever possible. (IA)
21. Acts on differences in pupil personality. (IA)
22. Acknowledges spontaneous interests of pupils where appropriate. (IA)
26. Asks one student to respond to another within a questioning strategy. (IA)
31. Implements objectives primarily through activities (rather than verbalization) which give the child the experience of the objective. (TC)

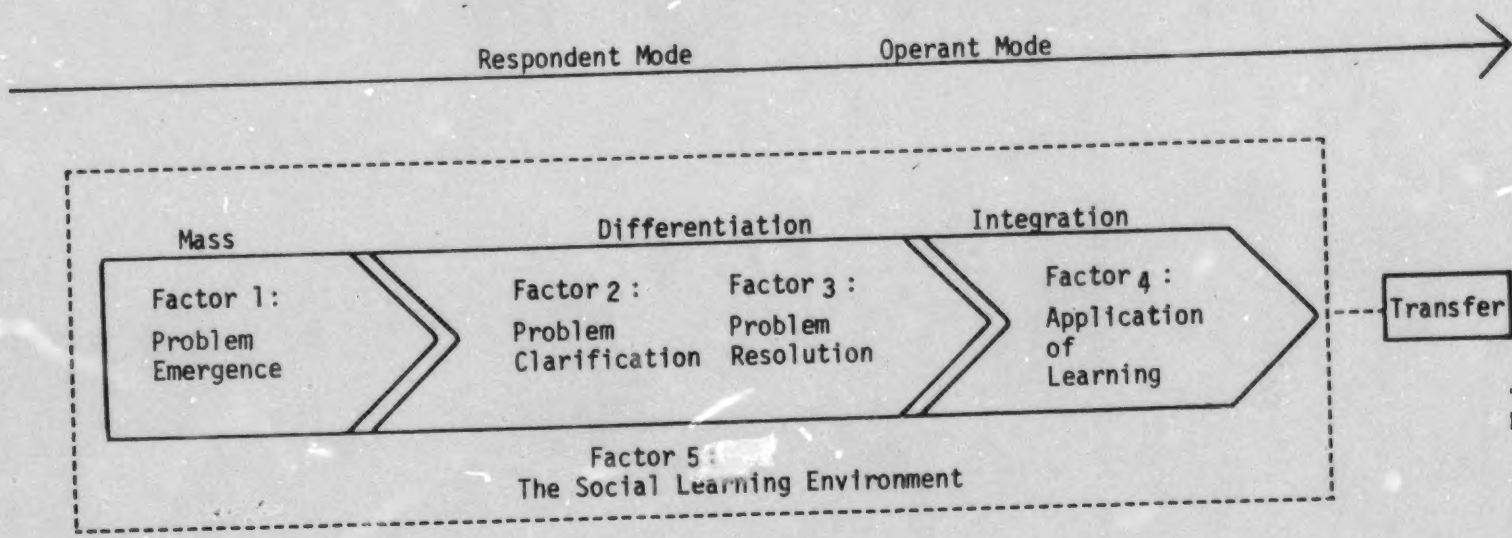
Students

50. Move around room in non-disruptive situations. (IA)
55. Interact constructively to solve a task related problem. (IA)
52. Express positive feelings. (IA)
53. Express negative feelings. (IA)
54. Are supportive of one another (IA)
57. Participate in decision making. (IA)
41. Expand on ideas. (CT)

Note: CT and IA refer to critical thinking and independent action.

FIGURE 4

The Social Learning Curriculum Implementation Process



The interrelationship of critical thinking and independent action, cognition and affect, within the social learning environment is apparent throughout the teaching-learning process. The general trend through the factors is towards student competence and autonomy outside of the classroom. This is represented by the box labeled Transfer in Figure 4.

The five-factor solution depicted within Figure 4, then, represents the empirical validation of an expanded version of the M-D-I model presented earlier in this monograph. It suggests that teacher-student behaviors, directed towards critical thinking and independent action, can be viewed within the framework of a social learning environment which facilitates the use of a problem-solving process oriented towards the application of an inductive style of reasoning. The model, in sum, represents the desired process of implementation for the Social Learning Curriculum. The implications of this factor structure will be discussed in a later section.

COMPONENTS OF VARIANCE ANALYSIS

Table 14 contains an estimate of the specific sources of variation obtained from the completely fixed, three-way (Classes x Lessons x Factors) ANOVA. The dimension of factor was that obtained from the previously described factor analysis.

The results suggest that it is not meaningful to look at differences in classes and lessons per se as important contributors to variation on the SLERS. Neither does it appear valuable to look at the interaction of classes and lessons. Perhaps this is because a "lesson" as an entity is too global a way of making comparisons and identifying differences. In addition, it is possible that the SLERS as a total instrument is not sensitive to differences in what the lessons contain or the way they are implemented in the classes.

However, when specific factors underlying the SLERS are considered, both classes and lessons can be differentiated. Most notably, it appears that the factors underlying the SLERS are differentially present in the lessons. In addition, it appears that the five factors underlying the SLERS are differentially implemented in the classes as well.

In order to clarify which specific factors were involved, additional two-way (Classes x Lesson) components of variance analyses were conducted for each SLERS factor.

Table 15 contains the variance estimates for classes and lessons for each of the five factors underlying the SLERS. These results clearly suggest that the classes can be most highly differentiated on the fifth factor, the social learning environment, and to some degree on Factor 1, Problem Emergence, and Factor 4, Application of Learning. That is, the classes differ most on the degree to which they establish an environment consistent with the M-D-I model as well as the degree to which they deal with problem emergence and application of learning behaviors. The six lessons, on the other hand, appear to differ the most on Factor 3, the problem resolution phase within the M-D-I structure.

IMPLEMENTATION AND LESSON ANALYSIS

Additional analyses were conducted in order to provide more direct information concerning the differential presence of the problem resolution factor in the lessons as well as the differential occurrence or implementation of the social learning environment, problem emergence and application factors in the classes. Table 16 contains the overall means for the item sets underlying each factor computed for each lesson (1 = infrequently occurring; 5 = frequently occurring). A more complete discussion of this procedure is presented in the previous section.

TABLE 14

Variance Components

SOURCE	VARIANCE COMPONENTS	PERCENTAGE OF VARIATION
Classes ($\hat{\sigma}^2_C$)	.03	.03
Lessons ($\hat{\sigma}^2_L$)	.04	.03
Factors ($\hat{\sigma}^2_F$)	.0	.0
Class X Lesson ($\hat{\sigma}^2_{CL}$)	0.00	.0
Class X Factor ($\hat{\sigma}^2_{CF}$)	.08	.07
Lesson X Factor ($\hat{\sigma}^2_{LF}$)	.14	.13
Residual ($\hat{\sigma}^2_{RES}$)	.81	.75

NOTE: ($\hat{\sigma}^2_F$) is estimated at zero because the original item scored and each of the 5 sets of Factor weights were standardized before the weighted linear combinations for the factors were calculated. The distribution of the five factors across the lessons and the classrooms were identical, thereby artificially setting the source of variation due to factors alone at zero.

TABLE 15

Variance Components for Each Factor

SOURCE	Factor One		Factor Two		Factor Three		Factor Four		Factor Five	
	Variance Component	% of Variation	Variance Component	% of Variation	Variance Component	% of Variation	Variance Component	% of Variation	Variance Component	% of Variation
Class ($\hat{\sigma}^2_C$)	.15	14%	.00	0%	.04	3%	.14	14%	.21	21%
Lessons ($\hat{\sigma}^2_L$)	.11	.11%	.09	9%	.45	42%	.08	8%	.00	0%
Residual ($\hat{\sigma}^2_{RES}$)	.77	75%	.95	91%	.59	55%	.79	78%	.79	79%

NOTE: These estimates are based on a completely fixed, two-way ANOVA.

TABLE 16

Raw Score Means for Item Sets
Underlying Each Factor for Each Lesson

Lessons	F 1	F 2	F 3	F 4	F 5
	Problem Emergence	Problem Clarification	Problem Resolution	Application of Learning	Social Learning Environment
Lesson One	2.6	2.9	1.9	1.9	3.1
Lesson Two	3.4	3.0	1.6	1.4	2.6
Lesson Three	3.2	2.9	2.8	1.4	2.6
Lesson Four	3.5	3.2	2.2	1.8	2.6
Lesson Five	3.4	3.3	2.7	2.1	2.8
Lesson Six	3.7	2.9	2.5	1.2	2.7
Overall Factor Mean	3.3	2.9	2.5	1.6	2.7

NOTE: A value close to one indicates that the factor was present in the lesson infrequently. A value close to five indicates that the factor was frequently present in the lesson.

The results indicate that the differential presence of the problem resolution factor is primarily associated with lessons one, two, three, and five. That is, the factor is least present in the first two lessons and most present in the 3rd and 5th lessons. This factor, as indicated earlier, represents the final steps in the inductive sequence and the last stage in the problem-solving process, just prior to the application of learning. The Social Learning Curriculum is organized generally within the framework of Mass, Differentiation, and Integration. Early lessons within a Phase represent the Mass stage, corresponding to Factor 1, Problem Emergence. Later lessons represent the Differentiation and Integration stages, corresponding to Factors 3 and 4, Problem Resolution and Application of Learning. An examination of the means for Factor 3 indicates the lowest scores occur on early lessons and the highest on later lessons. Therefore, the range and trend of the means for this Factor 3 appear consonant with the organization of the SLC. Earlier lessons are least conducive to problem resolutions; later lessons are more conducive.

Table 17 contains the overall raw score (1 = infrequently occurring; 5 = frequently occurring) means for the item sets underlying each factor computed by class. Again, see the previous section for a more complete discussion of this procedure.

These results confirm that the behaviors underlying the factors of the SLERS vary in the degrees to which they occur or are implemented in the classes. For example, on the Social Learning Environment factor, class 12 represents a "high" implementor, while class 4 is a "low" implementor. Behaviors associated with Factor 1, Problem Emergence, also occur to a much greater degree in class 12 than say classes 5 and 10. Finally, on Factor 4, Application

of Learning, class 14 appears to be a "high" implementor while class 1 is a "low" implementor.[5]

A partial explanation of the role of the SLE factor in differentiating the classes is suggested by the fact that it is the least specified part of the Social Learning Curriculum. Although a general atmosphere of acceptance and responsiveness is encouraged, instructions analogous to the detailed description of the inductive questioning sequence are not provided with regard to the class environment. It is not surprising, therefore, that this least specified factor most differentiated the classes.

The additional overall factor comparisons also indicate quite strongly that Factor 1 behaviors, associated with Problem Emergence, were observed most frequently in lessons and classes while behaviors associated with Factor 4, Application of Learning, were observed least frequently.

This indicates a trend towards greater presence and occurrence of early factors and lesser presence and occurrence of later factors within the model described in Figure 4. The factors in descending strength are: Factor 1, Problem Emergence; Factor 2, Problem Clarification; Factor 5, the Social Learning Environment; Factor 3, Problem Resolution; and, Factor 4, Application of Learning. Essentially, the least difficult dimensions within the problem-solving process appear frequently, the most difficult appear infrequently - not an unexpected event. The implications of these results for the Social Learning Curriculum and the training of teachers to use the SLC will be discussed at length in a subsequent section of this monograph.

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[5] The relationship between class differences on these factors and class/student outcome data will be examined in the second monograph.

TABLE 17

Raw Score Means for Item Sets
Underlying Each Factor for Each Class

Class	F_1 Problem Emergence	F_2 Problem Classification	F_3 Problem Resolution	F_4 Application of Learning	F_5 Social Learning Environment
One	2.99287	3.15542	2.70785	.93630	2.88125
Two	2.95047	2.98662	2.03185	1.32310	2.32995
Three	3.35755	2.92162	2.41308	1.46930	3.24505
Four	3.16777	3.21182	2.64945	1.26940	1.89715
Five	2.11867	2.43902	2.07735	1.55434	2.39935
Six	3.65387	3.15322	1.96145	1.80330	2.66197
Seven	3.72967	2.97437	2.55053	2.51820	3.22165
Eight	3.32127	3.41472	2.79735	1.48740	2.37475
Nine	2.84617	2.78252	2.75925	1.70301	3.65915
Ten	2.65757	2.51852	2.11445	1.21950	2.83055
Eleven	3.42507	2.88282	2.66655	1.95020	2.45585
Twelve	4.52867	2.27822	2.33335	1.39810	4.04065
Thirteen	3.37472	3.31652	2.91165	1.98630	2.37125
Fourteen	3.69117	2.96739	1.96625	3.02900	1.95135
Fifteen	3.42737	2.91415	3.24265	1.70367	2.29375
Sixteen	3.66667	2.99214	2.46998	1.06820	3.13345
Seventeen	3.20159	2.93844	2.22335	1.54573	2.46215
Overall Factor Mean	3.3	2.9	2.5	1.64	2.7

SECTION IV: DISCUSSION, CONCLUSION, AND IMPLICATIONS

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SUMMARY OF RESULTS

The principal findings of this study are as follows:

1. The Factor Structure underlying the Social Learning Environment Rating Scale (SLERS) generally validated the theoretical foundation of the Social Learning Curriculum from which it was developed.
2. Classes differed the most on behaviors associated with the Social Learning Environment factor, and to some degree, the Problem Emergence and Application of Learning factors.
3. The six lessons of Function VIII of the Social Learning Curriculum differed in the degree to which the behaviors associated with the Problem Resolution factor were present. This factor is less present in the early lessons and more present in later lessons.
4. Overall factor comparisons indicate quite strongly that behaviors associated with Factor 1, Problem Emergence occurred most frequently while behaviors associated with Factor 4, Application of Learning, occurred least frequently.

VALIDATION OF THEORY

Theoretically, the Social Learning Curriculum specifies an inductive teaching method within a Mass-Differentiation-Integration structure. To what degree are these theoretical components a classroom reality? The results of this study suggest that the implementation of the curriculum is characterized by a problem-solving process and a social learning environment (SLE) within which that process unfolds. The process consists of four factors or stages: Problem Emergence, Problem Clarification, Problem Resolution, and Application of Learning. The steps of the inductive teaching strategy occur within these

four stages. The SLE can be viewed as the psychological, social and, to an extent, physical background which facilitates student attainment of the major curriculum objectives: critical thinking and independent action.

The inductive teaching strategy specified by the Social Learning Curriculum is apparent in but not synonomous with the factors which comprise the problem-solving process. The factors themselves can be viewed within the M-D-I structure. The Mass is represented by Factor 1, Problem Emergence. Differentiation is characterized by Problem Clarification and Problem Resolution. Integration is apparent in Factor 4, the Application of Learning.

Essentially, the factor structure would appear to validate the basic theoretical foundations of the Social Learning Curriculum. It also suggests the need to examine with greater care the environment in which the curriculum is used. Four distinct stages of the problem-solving process have been identified. These four stages have been further defined by the items which comprise the factors. An examination of the factors depicts a teaching/learning transaction in which the teacher and students play equally important roles. These roles change as students gain confidence and competence. Students initially respond to the direction and guidance of the teacher and eventually operate with a greater degree of independence.

Data collection was based on the teaching of six lessons from a unit (Function VII) that deals with the identification and expression of emotions. While this Function is representative of other Social Learning Curriculum Functions in terms of the M-D-I structure's problem-solving process and the inductive teaching strategy, the content deals more with affective learning than does the content of other Functions. This raises the question as to the effect of differences in curriculum content on the factor structure of the

SLERS as well as on teacher implementation. Specifically, the appearance of an affectively oriented factor (The Social Learning Environment) might be due, in part, to the affective content of the curriculum. As stated previously, however, the appearance of affective items other than those dealing specifically with emotional expression supported the notion that an SLE factor would occur regardless of the specific curricular content. This hypothesis also seems reasonable in view of the developmental stages of the SLERS. The reader will recall that the SLERS was developed over three SLC units. Function V dealt with Communication Skills, and Function VI dealt with utilization and categorization while only Function VII dealt with emotions. Nevertheless, further investigation appears warranted and any replication of this study should specifically deal with the potential effect of different lesson content on the factor structure of the SLERS.

The appearance of prediction/verification items in the Problem Emergence factor suggests the possibility of a two-dimensional Mass stage. The first dimension requires the recognition by students that a problem does indeed exist. Only after problem recognition occurs can the problem itself be resolved. This issue carries with it certain implication for further development and revision of the curriculum which are discussed below.

The appearance of the prediction/verification items in Factor 1 also emphasizes the distinction between the problem-solving process and the inductive teaching strategy. The process itself consists of the four factors (stages) previously identified. The steps of the inductive teaching strategy - labeling through generalization - occur at various points within this process, but do not depend completely on any one of the four factors.

CURRICULUM DEVELOPMENT AND REVISION

This study revealed wide variation in the use of the Social Learning Curriculum. The sources of this variation rest with individual classes and the lessons of the SLC itself. The results strongly suggest the need to strengthen both the problem-solving process and the M-D-I structure within the written curriculum.

Of the five factors, Problem Resolution and Application of Learning showed the least implementation within classes. Problem Emergence and Problem Clarification showed the greatest strength. The most variation within classes appeared on the Social Learning Environment factor. Classes also varied significantly with respect to Problem Emergence and Application of Learning. The six SLC lessons differed the most on Factor 3, Problem Resolution.

When a given factor shows a high degree of occurrence within classes it is reasonable that it both appears in the written lesson and is implemented by the teacher. When the factor does not occur, there are at least two alternative explanations.

The first alternative is that the particular SLC lesson(s) in use is (are) not written in a manner conducive to the factor's occurrence. This may account for the differences among lessons on the Problem Resolution factor and the variation within classes on the Social Learning Envirooment factor. Within the M-D-I structure of the Social Learning Curriculum, the early lessons in a Function are not written to elicit problem solutions. Therefore, the presence of the Problem Resolution factor would not be expected in these lessons. As indicated in a previous section of this monograph, the construction of a classroom environment facilitative of critical thinking and independent action is not described in detail in the lessons of the SLC. Since the curriculum

provides the least information on the implementation of the Social Learning Environment it is not surprising that classes vary the most on this factor.

The second alternative explanation for the non-occurrence (or weak presence) of a factor focuses on the teacher's role in the use of the SLC. The teacher may not understand the M-D-I structure, the problem-solving process, or the steps of the inductive teaching strategy. The teacher may understand this structure, process, and strategy but experience difficulty in making the translation from cognitive awareness to actual teaching behaviors. For example, the teacher may have difficulty enabling students to generalize what they have learned from the resolution of a problem to a new situation, thus resulting in low implementation of Factor 4, Application of Learning. Finally, the premises which underlie SLC implementation may be inimical to the teacher's own view of "good teaching." The teacher may, for example, be more comfortable with a didactic approach wherein the teacher is the sole provider of information and students do not play as active a role in the acquisition and utilization of knowledge. A teacher with this perspective would not be likely to exhibit the behaviors which are the basis of the Problem Resolution and Application of Learning factors. However, if the teacher accepts the premise that students can learn from "incorrect" as well as "correct" responses, he/she is more likely to provide activities where students can explore alternative solutions, resolve conflict situations, and act independently. This second alternative explanation has implications for teacher training which are discussed later in this monograph.

Given the pattern of variation and strength of occurrence both within classes and across lessons, a number of recommendations to Social Learning

Curriculum developers would seem reasonable. The factor structure itself, particularly the two-dimensional Mass stage also suggests certain areas of concern for the curriculum developers. These areas focus on information to the developers concerning the written SLC only. In fact, a specific feedback questionnaire was constructed in order to provide curriculum developers with the data and findings obtained through the use of the SLERS. A copy of this questionnaire appears in the Appendix.

Given the relatively low degree of occurrence of factors 3 and 4, teachers appear to need greater information regarding the problem resolution and application of learning stages of the problem-solving process. Therefore, in the revision and development of curriculum materials, the writers would do well to focus on these two stages, emphasizing in the information provided to teachers both the necessity and techniques required to facilitate behaviors associated with the Prob em Resolution and Application of Learning factors.

Based on the finding that the Problem Resolution and Application of Learning factors were not implemented as strongly as the Problem Emergence and Problem Clarification factors, the following specific suggestions are made:

1) Several alternative activities should be written into the lessons which provide students with more opportunities to arrive at generalizations.

2) The stages of the problem-solving process and steps of the inductive teaching strategy might be stated as lesson objectives or mini-objectives.

3) The importance of having pupils explore options and try out alternative problem solutions should be given greater emphasis.

4) Generally, activities within a lesson should be labeled with regard to the stages of the problem-solving process. Teachers might then have a better notion of where Problem Resolution and Application of Learning fit into the continuum of the teaching-learning process.

Based on the findings that little provision is made for independent activity or application of learning, on the part of teachers, the following suggestions for curriculum revision and future development are made:

1) There should be more independent activities specified so that solutions arrived at in the respondent situation might be generalized to new but similar problems. This will help the student to process what he has experienced.

2) Additional activities which make possible the application of learning--without the teacher's guidance--should be provided. This would hopefully result in an increase in the students' independent actions.

3) Activities in both the respondent and operant modes should be structured to allow students the choice of working independently or with others.

Since the Social Learning Environment factor showed the greatest amount of variation, the developers should attempt to give teachers more specific information on how to construct a classroom atmosphere which is conducive to the problem-solving process. Teachers might be asked to recognize how elements of the environment influence problem-solving in the classroom. In addition, suggestions might be made as to how changes in the physical, social, and psychological environments within classrooms would contribute to independent action and critical thinking. Particular attention should be paid to accommodating individual differences and maximizing group interaction.

Revisions in the structure of curriculum units and the lessons which comprise these units may also serve to facilitate students' problem-solving abilities. The presence of a two-dimensional Mass stage suggests that the inductive teaching strategy is being used to arrive at an awareness of the

existence of a problem to be solved. This phenomenon can be utilized to increase students' understanding of the problem-solving process itself. Specifically, the Mass lesson in a unit should focus not only on the emergence of a problem, but equally upon the conscious definition of the process to be used in solving the problem. Within all lessons specific parts of the problem-solving process should be highlighted with particular emphasis on the generalizability of the process to more than one problem. If the general process, as well as the specific problem, were a major focus of each lesson, it would not be unreasonable to anticipate an increase in students' critical thinking skills. An increase in student independent action would also be expected if this renewed emphasis on student understanding of the problem-solving process were combined with the earlier suggestions regarding teacher information in the implementation of the Problem Resolution, Application of Learning, and Social Learning Environment factors.

FORMAL TEACHER TRAINING

The degree of variation in the implementation of the Social Learning Curriculum suggests that teachers do not fully understand the M-D-I structure and the problem-solving process demonstrated in this study. More formal attempts at facilitating the classroom implementation of the curriculum appear needed beyond those suggested in the previous section. This does not mean that uniformity is what is required. In fact, the creative adaptation of the curriculum to each unique teaching situation must be encouraged. However, implementation of the curriculum should reflect the problem-solving process within the M-D-I framework and the creation of an environment conducive to that approach. It has been found that the way pupils learn is influenced by the environment in which that

learning takes place (Walberg, 1969). It would appear, then, that teachers need to recognize aspects of the environment that influence individual and group problem solving. A formal teacher implementation program might include activities which are designed to assist teachers in structuring the environment so as to facilitate pupil problem solving.

There are several ways to communicate to teachers how the SLC is to be implemented. The first is within the context of the curriculum itself, as discussed previously. A second approach is through orientation to the materials prior to the use of the curriculum. A third approach is through direct teacher training in small groups using a number of well defined techniques, particularly micro-teaching. A fourth approach is the provision of a self-contained auto-instructional package which would accompany the curriculum.

The Social Learning Curriculum is uniquely experiential in nature. It logically follows that a program designed to train teachers in the use of a curriculum which emphasizes student learning through guided activity and problem solving should itself be experientially oriented. This notion also finds support in the work of a number of researchers in teacher training (Goldstein, Mischio, and Minskoff, 1969; Amidon and Hough, 1967; Flanders, 1970; Stanford Center for Research and Development in Teaching, 1974). These investigators have concluded that teacher training which is experiential in nature yields greater success in affecting teacher behavior than programs of a more traditional, didactic nature.

While small training groups would seem to provide an optimal setting, this approach makes the greatest demand on time, money and staff involvement. Additionally, small training groups would require the presence of a skilled leader, thus limiting drastically the number of teachers who could be reached. Therefore, an auto-instructional program as part of the SLC "package" would appear to be a

reasonable way of meeting a demonstrated need. This program might include optional activities where a workshop setting is possible. While it is beyond the scope of this monograph to delineate the format, goals, and content of such a program, certain suggestions are warranted.

The results of this study provide an empirically sound foundation for the construction of a teacher training program. Such a program should focus, at least in part, on competencies generated from the five factors which characterize the implementation of the SLC: Problem Emergence, Problem Clarification, Problem Resolution, Application of Learning, and the Social Learning Environment. The activities needed to develop these competencies should be germane to the realities of the classroom. That is, since the curriculum itself is used in the context of teacher-student transactions, training activities for teachers should also be designed with this context in mind. It may, in fact, be parsimonious to develop a short-term program with two goals: first, giving teachers the experience of the SLC implementation process and, second, giving students experience with the problem-solving strategy, emphasizing that strategy rather than the resolution of the particular problems at hand.

Finally, such a program could include a reduced version of the SLERS to enable teachers to monitor their own teaching. This scale would consist of a small number of items, perhaps the four to six highest loading items defining each factor. The revised scale would enable teachers to focus on both their own and their students' behavior with regard to each of the five factors. The inclusion of the revised scale would also provide an opportunity for additional classroom research and evaluation. Specific issues regarding these applications of the instrument are discussed in the next section.

INSTRUMENT DEVELOPMENT, REFINEMENT, AND USE

The purpose of employing factor analytic procedures in this study can be conceptualized in two ways. First, and most important, the procedure permits the examination of the underlying dimensions of the SLERS in relation to specific hypotheses derived from the M-D-I model of the SLC. Second, the factor analytic solution can be regarded as an effort at data reduction and parsimony--that is, from a practical standpoint that results justify a reduction from the original sixty item scores to a smaller subset of five (factor) scores that could be employed in subsequent studies or by supervisors and/or administrators in our field test network to focus their observations of their teachers implementing the SLC. In this particular situation, the factor analytic results can be used as an aid in item analysis and test construction with respect to the SLERS.

Factor scores are measures of the classes (teacher and student behavior) on the factors. Since five factors were found to underlie the sixty original items, it is possible to obtain just five scores calculated from the factors. Here is a simplified example with the factor matrix in Table 10. Suppose that one desired to calculate the Factor 2 score for a class. The raw score of the class on the five teacher items and the four student items, say, are 2,4,3,5,1,3,2,5, and 3, respectively. These scores can then be multiplied by the related factor loadings for Factor 2 as follows: $F_2 = (.57)2 + (.57)4 + (.49)3 + (.45)5 + (.42)1 + (.63)3 + (.49)2 + (.42)3$. This classroom's F_2 score is 13.79. The factor 2 score for other classrooms can be computed in the same way. However, it should be mentioned that this is not the only way to calculate factor scores. This example was given to convey the idea that such scores are weighed averages, the weights being the factor loadings. The point is that instead of using many

scores, fewer factor scores can be used.

There exists a considerable number of formal empirical procedures for appropriately obtaining the five factor scores from the original sixty items. For a more complete discussion of these methods see Harmon (1960). However, since the principal use of any factor scores obtained in this study would probably be with another sample of classes and with a reduced set of items, these procedures may not be appropriate. First, they require the use of all the items to calculate a factor score. Including all the items in any future work, however, may not be possible nor does it appear necessary given the results obtained here. Thus, only a limited number of crucial items need to be retained as the basis of the factor scores. Second, since the formal procedures capitalize on chance in the initial analyses, part of the solution will be based on nonsignificant differences. Thus, generalizations of complex weighting procedures from sample-to-sample are seldom as stable as one would expect (Guilford, 1965; Schmidt, 1971). Instead of using all items to estimate a factor score through a complex weighting procedure, a small set of items can be given simple weights to estimate a factor. This procedure permits a smaller number of items to be used in practical applications in the classroom and reduces the capitalization on chance (error). Where good data are available, further work might even be based on single items as a measure of a factor. More on this approach in a moment.

The first step in building an appropriate weight matrix is to determine which items are crucial and which are irrelevant based on the factor weight matrix. A crucial item may be defined as one with a weight of at least .40 on a factor; all other items are excluded. This, in fact, was the procedure for

retaining items employed in this study as presented in Tables 9 through 13 as well as the basis for making interpretations concerning the underlying factor structure. The weights or values assigned to the crucial items can be determined by several methods. One method would be to give each crucial item a weight equal to its correlation with the factor. This approach is similar to the procedure suggested on the previous page and appears most appropriate for use in subsequent empirical studies designed to cross-validate the factor structure obtained here or to examine differences in the factor structure as a function of SLC content. The resulting scale would consist of 52 of the original items--that is all of those specified in Tables 9 through 13. The weighting equations for converting a class's score on these items into the five factor scores are presented in Table 18.

This version of the instrument might also be employed to permit careful classroom monitoring and/or facilitation of the M-D-I structure, problem-solving process, and inductive teaching strategy by center staff or school administrators and field test advisors involved in the field testing of the Social Learning Curriculum. The items associated with each of the five factors could be used as a guide to observing a particular class without the need to actually compute a factor score. In this particular application there is less concern about the possibility that items might be redundant in an empirical sense and more concern about the representativeness of the items associated with a factor as well as their ability to provide clear direction to those making the observations. As an example, we might refer to the two items that were eliminated in the analysis of the factor

structure because they had a zero frequency of occurrence and were not discriminating. Item #16 requires the teacher to provide opportunity for different task-related activities to occur simultaneously, while item #49 requires the student to make use of activity centers independently or in a group. These items were eliminated in the interests of scientific parsimony. However, it is significant that they did not occur because of the possibility that there was no provision for them in the curriculum itself. Both items are examples of ways of providing for independent action on the part of pupils within the classroom, and independent action is one of the major pupil outcomes specified by the curriculum developers. For this reason, the use of factor analytic criteria per se in eliminating items from the scale does not appear completely satisfactory for this type of application.

In summary, then, an approach more in keeping with this application would be to explore several criteria for including items in this scale. One criterion might be the degree to which an item is logically and theoretically representative of a factor rather than strictly relying on whether or not the behaviors specified by the item were actually observed. To consider occurrence alone may cause items that are theoretically relevant to the original purpose of the scale to be eliminated. Another criterion would be to include more items with each factor for their explanatory value even though the rule of scientific parsimony is violated. These suggestions would serve as a more meaningful basis for using the SLERS in attempts to increase teachers' repertoire of behaviors concerning the M-D-I structure and the problem-solving process.

The simplest and most practical procedure, however, would be to let each factor be represented by four items--the two highest loading teacher items and the two highest loading student items. This approach would reduce the entire SLERS instrument to 20 items--four items for each of the five factors. Table 19 contains this version of the instrument.

TABLE 18

Factor Score Equations for Obtaining The Five Factors
Scales Based On 52 Of The Original SLEIRS Items

F_1 Score = .67(#6) + .63(#3) + .59(#2) + .58(#4) + .57(#5) + .56(#11) + .53(#1) + .50(#34) + .46(#24) + .41(#12) + .41(#9) + .56(#39) + .58(#44) -.46(#57) + .45(#54) + .44(#37)

F_2 Score = .57(#9) + .57(#23) + .49(#9) + .45(#8) + .42(#5) + .63(#42) + .49(#38) + .42(#40) + .42(#53)

F_3 Score = .66(#14) + .64(#13) + .61(#12) + .45(#31 + .66(#47) + .65(#46) + .57(#45) + .47(#55)

F_4 Score = .78(#28) + .75(#36) + .68(29) + .65(#18) + .46(#35) + .45(#32) + .42(#17) + .74(#56) + .68(#48) + .68(#51) + .56(#49) + .44(#50)

F_5 Score = .67(#19) + .62(#20) + .58(#17) + .58(#25) + .53(#24) + .52(#30) + .52(#21) + .47(#22) + .42(#26) + .40(#31) + ,57(#50) + .57(#55) + .56(#52) + .54(#53) + .54(#54) + .46(#57) + .42(#41)

In order to obtain the Factor Score for a class, the scale of the class on each of the items in parentheses must be entered, multiplied by the appropriate weight, and summed.

The following items are employed in the computation of Two Factor Scores, 9,12,24,31,50,55,53,54, and 57.

Practically speaking, this approach appears to be the most useful for assisting supervisors and administrators who are interested in quickly and efficiently observing their classrooms implementing the SLC with minimum loss of significant information. If the classroom is a unit of concern, the supervisor would be guided in the observation by both teacher and student items. However, if teacher behavior were of primary consideration, only ten items would be needed as a guide. Furthermore, this practical version of the SLERS should provide a reasonable focus for observations regardless of the specific phase of function being taught.

ROLE OF EVALUATION ACTIVITIES AT THE CURRICULUM RESEARCH AND DEVELOPMENT CENTER:

The development and use of the SLERS as an empirical instrument demonstrates the role of evaluation activities at the Curriculum Research and Development Center. That role is to share responsibility with the development unit for the curriculum that is produced. There are three major contact points or stages involving simultaneous evaluation and curriculum development activities--each of which will be demonstrated in this series of three monographs. These stages are: 1) refining objectives for a particular unit of the SLC; 2) developing instruments to assess the degree to which these objectives are implemented and achieved, and 3) analyzing and interpreting data for the purpose of revision and future development. These stages are highlighted in Figure five based on our previously established general working model. See Warshow, Bepko, and Becker (1974) for further discussion of this model.

The boxes containing asterisks indicate the parts of the stages or contact points involved in the construction of the SLERS. The instrument is unique in that it attempts to provide information on both the M-D-I structure problem-

TABLE 19

PRACTICAL VERSION OF SLERS

Teacher Behavior	Student Behavior
Problem Emergence Factor	
1. Teacher assists pupils in separating relevant from irrelevant information with respect to the problem to be solved.	1. Pupils label and detail appropriately.
2. Teacher implements the experience by focusing primarily on task rather than on self.	2. Pupils articulate alternative solutions to a problem.
Problem Clarification Factor	
1. Teacher provides opportunity for pupils to make associations between ideas.	1. Pupils make associations between ideas.
2. Teacher draws on background and experiences of pupils.	2. Pupils articulate problems related to the objective.
Problem Resolution Factor	
1. Teacher provides opportunity and helps pupils to use previously acquired concepts and skills in a new or different situation - with teacher help.	1. Pupils use previously acquired concepts and skills in a new or different situation - with teacher help.
2. Teacher provides opportunity for pupils to try out solutions to a problem.	2. Pupils try out solutions to a problem.
Application of Learning Factor	
1. Teacher provides opportunity for pupils to show that they have learned or understood something by solving a problem	1. Pupils work independently in solving a problem.
2. Teacher provides opportunity for pupils to use previously acquired concepts and skills in a new or different situation without teacher help.[a]	2. Pupils use previously acquired concepts and skills in a new or different situation - without teacher help.
The Social Learning Environment Factor	
1. Teacher allows pupils to express negative feelings.	1. Pupils move around room in non-disruptive situations.
2. Teacher allows pupil expression of positive feelings.	2. Pupils interact constructively to solve a task-related problem

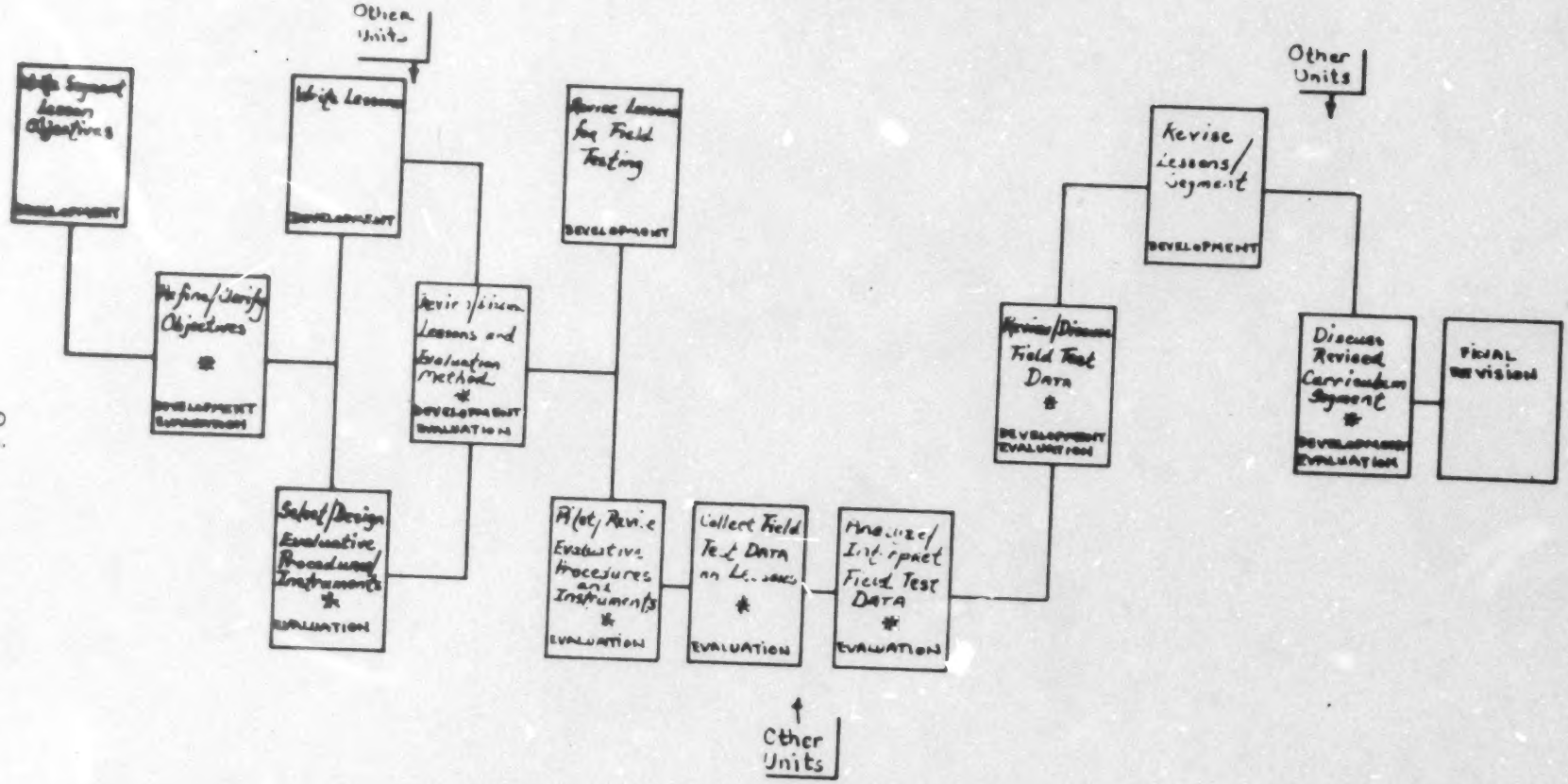
a. This item, which was the third highest loading on this factor, was substituted for the second highest loading item since it seems more highly related to the inductive methodology.

solving process and the teaching strategy specified by the curriculum developers. This monograph, then, can be regarded as a report of the instrument's ability to function in this capacity in order to satisfy evaluation needs outlined in stages one through three.

The second monograph will deal with an examination of the effect of the differences in SLC implementation identified here on specific student outcome measures. In this way, the working model at our center follows the type of process product investigations discussed by Rosenshine and Furst (1973) and employed in several follow-through projects (Soar, 1971; Stallings, 1974).

Figure 5

Working Relationship Between Development and Evaluation Activities in the Production of the Social Learning Curriculum



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APPENDIX

QUESTIONNAIRE FOR PROVIDING FEEDBACK TO DEVELOPMENT
J. Becker, S. Poloner and E. Savage

1. a) Was the activity structured to best facilitate meeting the objective?

_____Yes _____No

b) Please explain: Was success or failure of the activity due to a function of positive or negative:

Content of Curriculum Teacher Implementation Materials Student Variables

2. a) Were activities implemented according to the sequencing of mini-objectives outlined within the experience?

_____Yes _____No

b) Please explain: Were changes made or not made because of positive or negative:

Content of Curriculum Teacher Implementation Materials Student Variables

3. a) Was each mini-objective a logical component of the overall objective of the experience?

_____Yes _____No

b) Please explain: Were positive or negative results due to:

(+ or -) Content of Curriculum (+ or -) Teacher Implementation (+ or -) Materials (+ or -) Student Variables

4. a) Were mini-objectives stated so that the teacher had a clear idea of what the expected student outcomes were:

_____Yes _____No

b) Please explain results as due to positive or negative:

Content of Curriculum Teacher Implementation Materials Student Variables

5. a) Were any activities in the experience not used?

____Yes ____No

b) Which ones? Please list.

c) Please explain omission of activity(s) as due to positive or negative:

Content of Curriculum Teacher Implementation Materials Student Variables

6. a) Did the teacher create materials or activities to enhance the experience?

____Yes ____No

b) If yes, please list:

c) Please explain results as a function of positive or negative:

Content of Curriculum Teacher Implementation Materials Student Variables

7. a) Was Teacher Information complete enough in clarifying the objective?

____Yes ____No

b) Please explain clarity or lack of clarity as a result of positive or negative:

Content of Curriculum Teacher Implementation Materials Student Variables

8. a) Did the suggested dialogue and procedures for Teacher Action facilitate meeting the stated objective?

____Yes ____No

b) Please explain results as a function of positive or negative:

Content of Curriculum Teacher Implementation Materials Student Variables

Critical Thinking Questions:

9. a) Did the activity encourage pupils to name objects or elements in the learning environment?

_____Yes _____No

b) Please explain results as a function of positive or negative:

Content of Curriculum Teacher Implementation Materials Student Variables

10. a) Did the activity encourage pupils to separate relevant from irrelevant information with regard to the problem to be solved?

_____Yes _____No

b) Please explain results as a function of positive or negative:

Content of Curriculum Teacher Implementation Materials Student Variables

11. a) Did the activity encourage pupils to make associations between ideas?

_____Yes _____No

b) Please explain results as a function of positive or negative:

Content of Curriculum Teacher Implementation Materials Student Variables

12. a) Did the activity encourage pupils to articulate alternative solutions to a problem?

_____Yes _____No

b) Please explain results as a function of positive or negative:

Content of Curriculum | Teacher Implementation | Materials | Student Variables

13. a) Did the activity encourage pupils to try out alternative solutions to a problem?

_____Yes _____No

b) Please explain results as a function of positive or negative:

Content of Curriculum | Teacher Implementation | Materials | Student Variables

14. a) Did the activity encourage pupils to predict consequences of solutions to the problem?

_____Yes _____No

b) Please explain results as a function of positive or negative:

Content of Curriculum | Teacher Implementation | Materials | Student Variables

15. a) Did the activity provide opportunity for pupils to use concepts and skills previously acquired in a new and different situation?

_____Yes _____No

b) Please explain results as a function of positive or negative:

Content of Curriculum | Teacher Implementation | Materials | Student Variables

Independent Action Questions:

16. a) Did the activity lend itself to the structuring of a classroom environment that reflected and encouraged optimal pupil participation?

_____Yes _____No

b) Please explain results as a function of positive or negative:

Content of Curriculum Teacher Implementation Materials Student Variables

17. a) Did the activity encourage the acceptance of the differences in pupil personality?

_____Yes _____No

b) Please explain results as a function of positive or negative:

Content of Curriculum Teacher Implementation Materials Student Variables

18. a) Did the activity encourage the pupils to use their own experiences?

_____Yes _____No

b) Please explain results as a function of positive or negative:

Content of Curriculum Teacher Implementation Materials Student Variables

19. a) Did the activity encourage pupil to pupil interactions (task related)?

_____Yes _____No

b) Please explain results as a function of positive or negative:

Content of Curriculum Teacher Implementation Materials Student Variables

20. a) Did activity encourage pupil to pupil interactions - non-task related?

_____Yes _____No

b) Please explain results as a function of positive or negative:

Content of Curriculum Teacher Implementation Materials Student Variables

21. a) Did the activity provide an opportunity for individual pupils to show that they have learned or understood something by solving a problem related to the task - without teacher help?

____Yes ____No

b) Please explain results as a function of positive or negative:

Content of Curriculum Teacher Implementation Materials Student Variables

22. a) Was there any critical event (unusual occurrences) that best explains the success or failure of the activity?

____Yes ____No

b) Please explain the event as a function of positive or negative:

Content of Curriculum Teacher Implementation Materials Student Variables

Other?